California High-Speed Rail Authority

RFP No.: HSR13-57

Request for Proposals for Design-Build Services for Construction Packages 2 - 3

Reference Material, Part C.13 – Site-Specific Hazard Analysis of Adjacent Railroad Operations

California High-Speed Rail Program

HAZARD ANALYSIS REPORT

Site-Specific Hazard Analysis of Adjacent Railroad Operations in the CP02-03 Alignments

Rev.	Date	Description
0	08 SEP 2014	Initial release

Note: Signatures apply for the latest technical memorandum revision as noted above.

Prepared by PARSONS BRINCKERHOFF

for the California High-Speed Rail Authority

System Safety Reviews

The purpose of the System Safety Review is to ensure:

- Consistent application and appropriateness of safety analysis techniques

Author:	John Cockle, Safety Specialist	Date
Internal Safety Reviewer:	Tim White, Safety Specialist	Date
External Safety Reviewer:	Gulzar Ahmed, Safety Specialist	Date
CHSRA Review:	Victor Salazar, Safety & Security Manager	Date

Note: Signatures apply for the technical memorandum revision corresponding to revision number in header and as noted on cover.

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ABSTRACT/EXECUTIVE SUMMARY

Locating the California High-Speed Rail Program (CHSRP) adjacent to existing freight and passenger railroads allows for the construction and operation of a trainway that is, in most cases, least disruptive to the surrounding community. It does, however, also introduce a hazard that must be examined in detail in order to understand the associated hazard risk and to support the application of measures of mitigation to reduce the hazard risk to an acceptable level. The peculiarity of the hazards associated with adjacent railroad operations requires the identification of a specific process for examining the hazard risk. CHSRP has identified that process, called the Adjacent Railroad Hazard Risk Assessment Model and described in Technical Memorandum 500.05 *Adjacent Railroad Hazard Risk Assessment Model.*

This Site-Specific Hazard Analysis Report describes the process of applying the Adjacent Railroad Hazard Risk Assessment Model to the Construction Package of the California High-Speed Rail Program that is located between the south side of Fresno and the Tulare/Kern county line, commonly known as CP0203-03. This report also describes the findings of the application of the Model.

In summary, of the twenty-one segments assessed, four were found to contain characteristics that result in a hazard risk that is ***Unacceptable***. The results of the hazard analysis suggest that the Authority should install intrusion protection measures consistent with the requirements of *Technical Memorandum 2.1.7 Rolling Stock and Highway Vehicle Intrusion Protection for High-Speed Rail* in the *Unacceptable* segments in order to mitigate the hazard risk. The assessment of post-mitigation conditions will be required to confirm that the residual hazard risk is acceptable to the Authority. Several of the segments with BNSF yards and/or industries, however, can be downgraded in their risk assessments if it can be demonstrated that the yards and/or industries are either out of service or used so infrequently as to effectively consider them to be of no risk. These segments include CP0203-03 at Bowles, CP0203-07 at Monmouth, and CP0203-18 at Angiola.

Five segments were found to contain characteristics that result in hazard risk that is classified as ***Undesirable***. The hazard risk in these segments can be accepted only where further risk reduction is impracticable. Alternative changes to the physical or operating characteristics of the adjacent railroad and surrounding corridor should be considered and discussed with the railroad for the *Undesirable* segments. If alternative railroad characteristics are not practicable, then the Authority can make the decision to accept the residual hazard risk. Acceptance of the hazard risk lies ultimately lies only with the California High-Speed Rail Authority.

Five segments were found to contain characteristics that result in a hazard risk that is ***Tolerable***. The hazard risk in these segments should be acceptable with review by the Authority.

Finally, seven segments were found to not contain a hazard risk due to the distance of track center lines between the CHSRP trainway and the adjacent railroad greater than 125 feet or an elevation differential in favor of the CHSRP alignment greater than 10 feet.

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this report is to describe the process and findings of the Site-Specific Hazard Analysis (SiSHA) for the potential of derailments on an adjacent railroad that could affect the California High-Speed Rail Program (CHSRP) trainway in the alignment segment encompassing Construction Package 02-03 (CP0203). The report utilizes the Adjacent Railroad Hazard Risk Assessment Model (ARHRAM) developed by for CHSRP.

1.2 GOAL

The goal of this report is to identify the relative likelihood that a derailment on an adjacent railroad at a particular location will intrude upon the CHSRP trainway with catastrophic results. The relative likelihood of the occurrence of this hazard will establish a Hazard Risk Index Value for the location, allowing the California High-Speed Rail Authority to determine the need for and extent of the application of measures of mitigation (increased distance between track centers or physical intrusion protection barriers such as ditches, berms, or walls) in order to achieve an acceptable level of hazard risk. This report makes recommendations with respect to application of measures of mitigation based on the Relative Hazard Frequency Assessment (RHFA) and the Risk Assessment Matrix found in the CHSRP Safety and Security Management Plan.

1.3 SCOPE OF THE ASSESSMENT

The scope of this site-specific hazard assessment is limited geographically to the CP0203 segment between Fresno, CA and Bakersfield, CA. The northern boundary is East American Avenue south of the City of Fresno, CHSRP Station 11290+00. The southern boundary is the Tulare/Kern County Line, CHSRP Station 5270+00. The scope of the assessment is focused on the true CHSRP operations only, not on the intrusion barrier requirements as they might be required for the operation of conventional trains along the CHSRP alignment in an independent utility phase.

The scope of the hazards considered by this site-specific hazard assessment is limited to the hazard of a derailment or other incident (shifted load) on an adjacent railroad that physically intrudes upon the CHSRP trainway or causes an overhead structure to collapse. Not considered in this report is the hazard of a derailment on an adjacent railroad that results in a hazardous material incident that affects the CHSRP trainway. The effects of such an event cannot be mitigated by the installation of a physical barrier between the two railway systems, but rather only by changes to the operations or infrastructure of the freight railway, or by relocation of the CHSRP entirely away from the freight railway (which is contrary to the requirement of Proposition 1-A to locate the CHSRP within existing transportation corridors).

1.4 REFERENCE MATERIAL

The following CHSRP documents were used in the development and implementation of this assessment:

- Technical Memorandum 2.1.7 *Rolling Stock and Highway Vehicle Intrusion Protection for High-Speed Rail,* Rev1
- Technical Memorandum 500.05 *Adjacent Railroad Hazard Risk Assessment Model*, Rev0
- *Safety and Security Management Plan*, Rev 0

The following CHSRP draft 15% design drawings were used in the development and implementation of this assessment:

- Alignment M drawings, dated 04/05/2013
- Alignment K4 drawings, dated 04/05/2013
- Alignment C2 drawings, dated 04/05/2013
- Alignment P drawings, dated 04/05/2013
- Alignment A1 drawings, dated 04/05/2013

The following railroad documents were used in the development and implementation of this assessment:

- BNSF Railway *California Division Timetable #1*, effective 2/9/2011
- BNSF Railway *Track Chart, Bakersfield Subdivision*, revised 7/21/2006

The following other sources were used in the development and implementation of this assessment:

- Google Earth imagery as of 9/2/2014
- *California Region Timetable 18*, dated March 2007, Altamont Press

1.5 DEFINITION OF TERMS/ACRONYMS

Terms

Alignment:	The engineered or established line and direction of the track.
Authority:	California High-Speed Rail Authority.
Construction Package 02-03	The Portions of the California High-Speed Train Project located between East American Avenue in Fresno and the Tulare/Kern County line near Allensworth.
Right-of-Way:	The physical land between the railroad property lines.
Trainway:	Railroad operating envelope; on the CHSRP, generally the area between the outermost OCS poles and any other facilities that could affect the CHSRP operations. On adjacent freight railroads, generally the area between lines that are 25 feet from the outer-most track centers.
Turnout:	The track structure, including switch points, frogs, and all supporting infrastructure within the clearance points, which allows movement of trains from one track to another.

Acronyms

ARHRAM	Adjacent Railroad Hazard Risk Assessment Model
BNSF	BNSF Railway
CHSRP	California High-Speed Train System
CP0203	Contract Package 02-03
CTC	Centralized Traffic Control
GCOR	General Code of Operating Rules
MP	Mile Post
MT	Main Track.
OCS	Overhead Contact System
RHFA	Relative Hazard Frequency Assessment
SiSHA	Site-Specific Hazard Analysis
SJVR	San Joaquin Valley Railroad
SR	State Route (California highway designation)
SSEC	Safety and Security Executive Committee
UPRR	Union Pacific Railroad

2.0 DESCRIPTION OF THE PROCESS

2.1 ARHRAM MODEL

The hazard risk assessment was completed using the ARHRAM risk assessment process outlined in *Technical Memorandum 500.05 Adjacent Railroad Hazard Risk Assessment Model, Rev1*. ARHRAM assesses the relative hazard frequency of a derailment or other incident on an adjacent railroad property that could result in a catastrophic incident occurring on the CHSRP trainway. The adjacent railroad is assessed for the presence of eight individual characteristics, called causation factors, which could cause a derailment to occur. An additional six characteristics, called effect factors, are assessed for the influence that they could assert on the incident to intrude upon the CHSRP trainway. Two nullifying factors are also considered for their ability to completely mitigate the hazard. Table 1 shows the values assigned to the various characteristics of the sixteen factors.

Table 1 -- Characteristic Rating Table

Category	Condition	Value
Causation Factors		
Horizontal Alignment	Tangent	0
	Horizontal Curve	.1
Vertical Alignment	Grade < 1%	0
	Vertical Curve or Grade >= 1%	.1
Type of Movement	Through movement, no stops	0
	Speed change or routine stopping point	.1
	Yard/industrial switching	.3
Special Track work	None	0
	Single	.1
	Multiple	.2
Movement Authorization	Timetable/Special Instruction only	0
	Block Signal System	-.1
	Positive Train Control	-.5
Access to Right-of-Way	Open, no controls	0
	Access-control barrier	-.1
Highway-Rail Grade Crossing	None	0
	Private	.1
	Public	.3
Train Defect Detectors	None	0
	Standard train defect detector within 5 miles	-.1
	WILD w/in 50 mi.	-.2
Effect Factors		
Horizontal Alignment	Tangent	0
	CHSRP on inside of curve	-.2
	CHSRP on outside of curve	.2
Speed	Less than 20 mph	0
	Between 21 and 40 mph	.1
	Greater than 40 mph	.2
Horizontal Distance	Greater than 102 feet	0
	102 feet to 86 feet	.1
	85 feet to 59 feet	.3
	Less than 59 feet	.6
Elevation	At-grade	0
	Elevated greater than 10 feet	.4
	Below-grade greater than 10 feet	-.4
Adjacent Structure	None	0
	Deflects derailment toward CHSRS	.1
	Contains derailment per TM 2.1.7 criteria	-.7
Overhead Structure	None, or protected	0
	Unprotected overhead structure	.2
Nullifying Factors		
Horizontal Distance	125 feet or greater	0
	Less than 125 feet	1
Horizontal/Vertical Sep.	Horizontal separation > 25 feet and Vertical separation > 10 feet	0
	Other than above	1

The Site-Specific Derailment Frequency (SSDF) represents a characterization of the frequency of derailments at the location for the railroad under consideration and adjusted for the number of trains operated at the location in question.

Causation factor categories and effect factor categories are each assigned an initial value of one (1.0) to represent the base operation of trains at the location. The initial value is then increased or decreased according to the presence (or absence) of the site characteristics under consideration. The end result is a positive value[1] that represents an assessment of the cause and effect conditions at the location.

The aggregate score for each of the four categories is then input to the RHFA Formula shown in Figure 1, producing a numerical value that is known as the Relative Hazard Frequency Assessment (RHFA).

Figure 1 – RHFA Formula

$$RHFA = (SSDF)\ (F_C)\ (F_E)\ (NF_{HD})\ (NF_{HVC})\ (0.01)$$

RHFA = Relative Hazard Frequency Assessment

SSDF = Site-Specific Derailment Frequency

F_C = Cause Factor

F_E = Effect Factor

NF_{HD} = Nullifying Factor – Horizontal Distance

NF_{HVC} = Nullifying Factor – Horizontal/Vertical Clearance

A scale factor of 0.01 is applied to the formula to create a range of values between 0 and 1000. The scale factor in no way alters the relationship between the RHFA scores, but rather provides for a range of scores that are simple to understand and compare.

The RHFA identifies the classification for the likelihood of the occurrence of the hazard using Table 2. The RHFA and Classification is the final piece of information input to the ARHRAM Worksheet.

Table 2 -- Relative Hazard Frequency Assessment and Classification

RHFA	Classification
RHFA > 360	Occasional
360 => RHFA => 310	Remote
310 > RHFA	Highly Unlikely

The definitions for the classifications themselves are derived from the CHSRP Safety and Security Management Plan[2], and in the context of this Model are as follows:

- **Occasional**: A derailment on the adjacent railroad that affects the CHSRP trainway is likely to occur sometime in the life of the CHSRP at the location under consideration.
- **Remote**: A derailment on the adjacent railroad that affects the CHSRP trainway is unlikely but possible to occur in the life of the CHSRP at the location under consideration.
- **Highly Unlikely**: A derailment on the adjacent railroad that affects the CHSRP trainway is so unlikely that it can be assumed the occurrence may not be experienced at the location under consideration.

[1] The values must always be above zero. If the values were negative they would represent a negative operation, which is an illogical condition considering that we know that trains operate at the location. In addition, negative values would mathematically alter the outcome of the RHFA formula in an illogical way. The worst case scenario for all negative values is still above zero.

[2] CHSRP Safety & Security Management Plan, *Table 4-4 Frequency of Occurrence*

Note that the CHSRP risk acceptance criteria classifications of Frequent and Probable are not included as it is not reasonable to think that adjacent derailments will occur at these rates. FRA regulations, and railway operating practices, will produce a probability less than these (i.e. not greater than "likely to occur sometime in the life of the System").

It is reasonable to assume that the consequence from a collision between CHSRP and a freight train would be **Catastrophic,** defined as "Could result in one or more of the following: Multiple fatalities or equivalent fatalities; irreversible significant environmental impact; monetary loss equal to or exceeding $10M; severe damage or total loss of rolling stock; severe damage to infrastructure or other severe system loss causing all or a significant portion of the system to be unavailable for normal service for more than 72 hours; or reputational damage of national impact"[3]. The Consequence Classification is combined with the Frequency Classification from Table 2 through the application of the Risk Assessment Matrix[4] shown in Figure 2.

Figure 2 -- Risk Assessment Matrix

California High-Speed Train System Technical Memorandum 500.06, Rev 0

Table 3 Risk Assessment Matrix

Probability \ Severity	1 Catastrophic	2 Critical	3 Marginal	4 Negligible
(A) Frequent	1A	2A	3A	4A
(B) Probable	1B	2B	3B	4B
(C) Occasional	1C	2C	3C	4C
(D) Remote	1D	2D	3D	4D
(E) Highly unlikely	1E	2E	3E	4E
(F) Eliminated				

The Risk Acceptance Matrix (Table 4) identifies required actions to reduce risk based on the risk rating. The Authority will accept the residual risk through the Safety and Security Executive Committee process where appropriate; direct approval of individual risk acceptance decisions for hazard risks categorized as *High*, or review and approval or hazard analysis reports for hazard risks categorized as *Moderate*. Hazard risks categorized as *Acceptable* do not require SSEC review and approval.

Table 4 Risk Acceptance Matrix

Hazard Risk Index	Risk Rating	Action Required
1A, 1B, 1C, 2A, 2B, 3A	Unacceptable	Risk must be reduced and managed
1D, 2C, 2D, 3B, 4A	Undesirable	Risk is acceptable only where further risk reduction is impracticable. Authority decision required to accept residual risk
1E, 2E, 3C, 3D, 4B	Tolerable	Apply mitigations where reasonably practicable. Risk can be tolerated and accepted with adequate controls. Authority review required to accept residual risk.
3E, 4C, 4D, 4E	Acceptable	No further risk reduction required
	Eliminated	None

[3] CHSRP *Safety and Security Management Plan*, Rev1

[4] CHSRP Technical Memorandum 500.05 *Hazard Risk Acceptance Program*, Rev0

Since derailment of an adjacent railroad that intrudes into the CHSRP trainway must always be considered to be Catastrophic, the movement within the Risk Assessment Matrix can only be up or down within the Catastrophic column (1), depending on the conditions and mitigations that affect the Frequency Classification. The result is a Hazard Risk Index, allowing the Authority to determine the acceptability of the residual risk, or the need for and extent of the application of additional mitigation measures in order to achieve a level of residual hazard risk that is acceptable to the Authority.

2.2 APPLICATION OF ARHRAM TO CP0203-03

To apply the ARHRAM to the CP0203-03 locations, the adjacent railroad right-of-way was assessed for the site-specific physical characteristics. The right-of-way was broken into segments in which the physical characteristics of the adjacent railroad are all of a similar nature. For example, a length of two mile main track right-of-way in which there is no switches, curves, grade changes, or other significant physical characteristics is considered one segment. The adjacent quarter-mile length of right-of-way in which a switch expands the one main track to two main tracks is considered the next segment, and so on. Segments were also divided according to characteristics of the CHSRP trainway. The result is twenty-one distinct segments in CP0203-03.

Each segment was then assessed for the presence of each of the sixteen characteristics considered by the ARHRAM. Initial assessment was made using 15% design drawings and Google Earth during the week of September 23, 2013. Field visits were conducted for the purpose of verifying the characteristics of the adjacent railroads: October 2-3, 2013 to assess segments CP0203-17 through CP0203-21, October 9, 2013 to assess segments CP0203-01 through CP0203-12, and October 16, 2013 to assess segments CP0203-13 through CP0203-16.

ARHRAM worksheets were completed in the field for each of the segments (and are included in Appendix A). The information from the ARHRAM worksheets was then input to the computer worksheets to calculate the RHFA and Classification for each segment. The Model's input was updated in August and September 2014 to reflect FRA derailment data for calendar year 2013 and revised risk assessment methodologies found in Rev1 of Technical Memorandum 500.05 *Adjacent Railroad Hazard Risk Assessment Model*.

2.3 ASSUMPTIONS

The following assumptions were made during the assessment:

- The hazard risk associated with adjacent railroads was assessed based on conditions as were extant on the days of the field visits. Railroad traffic volumes were estimated based upon unofficial input from industry sources and general knowledge of the current railroad operating patterns. Detailed information regarding the current railroad operations will provide further refinement to the assessment. Future changes in physical characteristics or traffic volumes cannot be accurately anticipated and therefore will require re-assessment of the hazard risk.
- Railroad operating parameters used in the assessment include the following:
    - Amtrak operates 12 daily *San Joaquin Service* passenger trains over this portion of the right-of-way between 7 am and 10 pm. The trains consist of either 4 or 5 cars and one locomotive, operating in push-pull mode with the locomotives generally situated on the south end. The number of Amtrak trains was halved to 6 in order to account for the safer derailment performance when compared to BNSF freight train operation, primarily due to their small size and relatively light tonnage, tight-lock couplers that tend to keep them more aligned in the event of a derailment, and their closely-controlled operating parameters.
    - The BNSF operates a two-track CTC-controlled railroad with operating speeds established at 79 mph for passenger trains and 70 mph for selected freight trains except where noted. The main tracks are under the direct control of the BNSF train dispatcher in San Bernadino, CA. The United States Department of Transportation Grade Crossing

Inventory database was used to determine the number of trains operating on the corridor, generally 32 daily BNSF freight trains between Fresno and Bakersfield. Grade crossing inventory reports varied anywhere between 37 and 45 daily trains (including 12 Amtrak), but 44 appeared to be the most common figure.

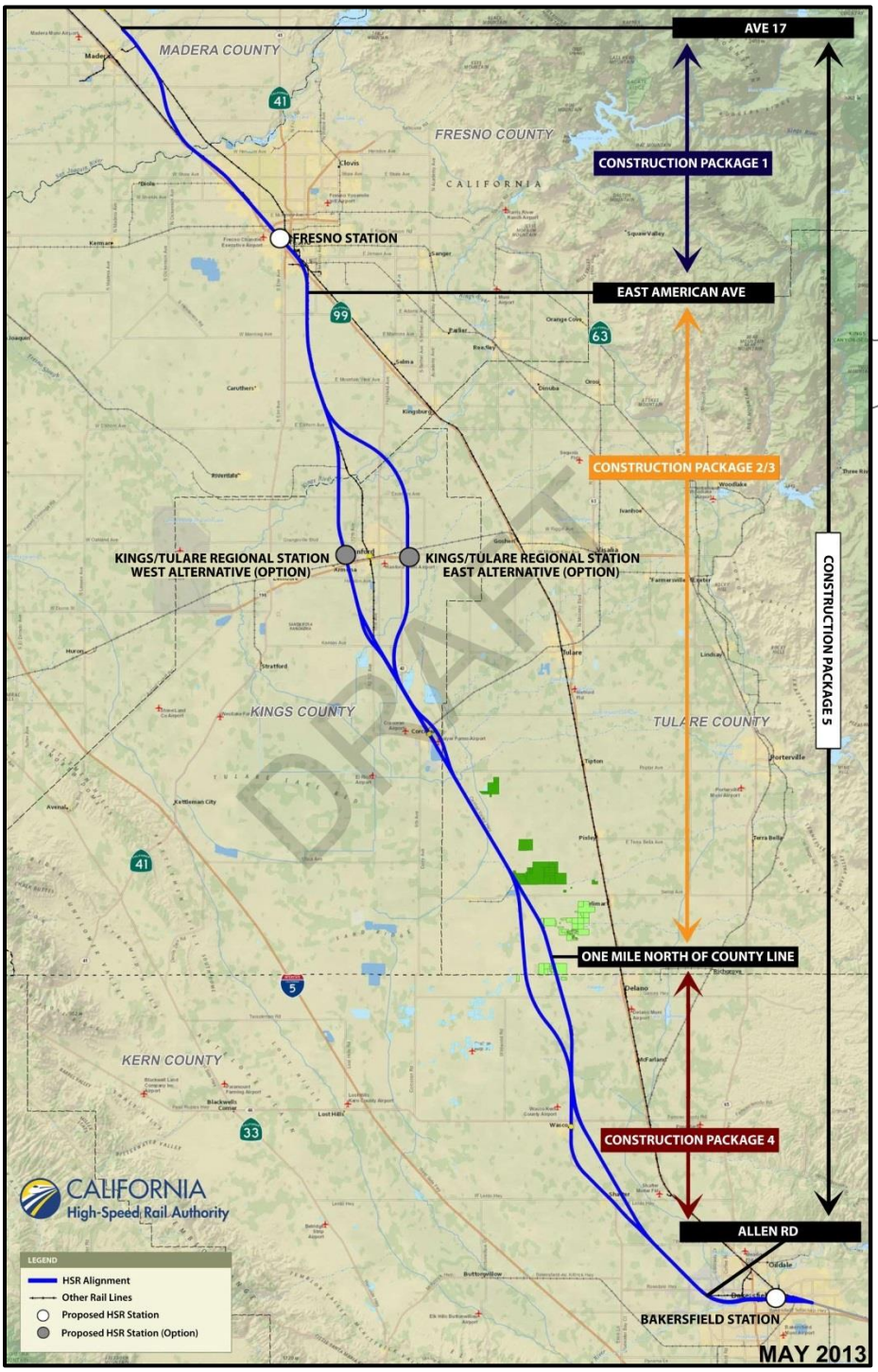
  - The number 38 (32 BNSF and 6 Amtrak) will be used to calculate the derailment frequency for the Fresno-Bakersfield corridor.

- The characteristics of the CHSRP were assessed based on the most advanced level of design approved on the dates of the field visits. While draft plans were taken into consideration, they are subject to change and therefore cannot be relied-upon for accuracy.
- The CHSRP was assessed based upon design toward the final configuration as an exclusive-use high-speed rail corridor. The assessment does not consider the hazard risk associated with any interim or otherwise contemplated solution such as use by Amtrak *San Joaquin Service* or blended service. These levels of service, when fully developed from a planning perspective, will require their own level of hazard risk assessment.

3.0 ASSESSMENT / ANALYSIS

The Adjacent Railroad Hazard Risk Assessment Model was used to assess the hazard risk associated with adjacent railroad right-of-way for all 75 miles of the CP02-03 alignment, shown in orange in Figure 3.

Figure 3



Summary assessments of each segment are described in the sections that follow. ARHRAM worksheets and notes from field visits for each segment are included in Appendix A.

SEGMENT CP0203-01

This segment, approximately 12,800 feet in length, extends from the north limit of CP0203 at East American Avenue to the northern limits of the Bowles crossover interlocking plant, north of E. South Avenue. The CHSRP alignment is planned to allow approximately 102 feet lateral distance to the nearest BNSF main track and approximately 10 feet above existing grade (only 5-6 feet above BNSF top-of-rail). Figure 4 shows the typical arrangement of the BNSF in this segment looking south (BNSF eastbound) toward the Bowles crossovers. The CHSRP trainway proposed to be located to the right of the BNSF tracks shown in the photo.

Figure 4

This segment represents the northern approach to the Bowles crossovers, a major point of stopping and meeting trains and hence a higher risk for derailments/collisions due to slack action, train meets, and other operations activities.

Current grade crossings include Lincoln Avenue, Adams Avenue, and Clayton Avenue. The first two crossings are to be grade-separated with overhead highway structures while the latter crossing is to be closed. There are no grade crossings planned to remain within this segment.

The surrounding property is private farmland and residential. Most property is open and uncontrolled, providing direct access from the farm fields and dirt roads that terminate at the BNSF right of way.

The RHFA for Segment CP0203-01 is 337.87, resulting in a classification of *Undesirable*. This medium-level RHFA is due primarily to the approach to the Bowles crossover where trains frequently meet, and the lack of access control measures along the right-of-way. Providing increased intrusion protection to the east side of the BNSF right-of-way in the form of access control for pedestrians and appropriate vehicle intrusion protection should reduce the RHFA to 304.09, sufficient to move the classification into the category of *Tolerable*.

SEGMENT CP0203-02

This segment, approximately 2,600 feet in length, encompasses the limits of the Bowles crossover interlocking. The CHSRP alignment is planned to allow approximately 102 feet lateral distance to the nearest BNSF main track and approximately 10 feet above existing grade (only 5-6 feet above BNSF top-of-rail). Figure 3-5a was taken from South Avenue looking north (BNSF westbound). Figure 3-5b was taken from South Avenue looking south (BNSF eastbound). The CHSRP trainway is proposed to be located to the left of the BNSF tracks shown in Figure 5a, to the right in Figure 5b.

Figure 5a

Figure 5b

This segment represents the entire limits of the Bowles crossovers plus the west switch to the Bowles siding on the west side of the BNSF right-of-way. Bowles is a major point of stopping and meeting trains and hence a higher risk for derailments/collisions due to slack action, train meets, and other operations activities.

One current grade crossing crosses BNSF within the limits of the segment: South Avenue, which crosses within the limits of the Bowles interlocking between the south end of the crossovers and the West Switch of the Bowles siding. South Avenue is to be grade-separated with an overhead highway structure. There are no grade crossings planned to remain within this segment.

The surrounding property is private farmland and residential. Most property is open and uncontrolled, providing direct access from the farm fields and dirt roads that terminate at the BNSF right of way. Access will be more restrictive when South Avenue is closed.

The RHFA for Segment CP0203-02 is 371.66, resulting in a classification of *Unacceptable*. This high-level RHFA is due primarily to the pattern of frequently meeting or crossing-over trains at Bowles, the main track turnouts themselves, and the lack of access control measures along the right-of-way. Installation of an intrusion protection barrier per the requirements of Technical Memorandum 2.1.7 and an access control barrier on the east side of the BNSF alignment to prevent trespassing and vandalism should reduce the RHFA to 281.56, resulting in a classification of *Tolerable*.

SEGMENT CP0203-03

This segment, approximately 9,900 feet in length, extends from the south limits of the Bowles crossover and West Switch Bowles to the north limits of the East Switch Bowles. The BNSF alignment currently includes a 0 degree, 30 minute curve that is planned to be re-aligned into an even broader degree of curvature. The CHSRP alignment is planned to allow approximately 102 feet lateral distance to the nearest BNSF main track and approximately 10 feet above existing grade (only 5-6 feet above BNSF top-of-rail). Figure 3-6 was taken from Manning Avenue looking south (BNSF eastbound) with the BNSF industry/yard tracks to the right. The CHSRP trainway is proposed to be located to the right in Figure 6.

Figure 6

The Bowles siding is a controlled siding, with use authorized by the train dispatcher. The yard and industry tracks can be used without authority from the dispatcher, yet then cannot be accessed except from the Bowles siding. The yard tracks located south of Manning Avenue are used for short-term storage of intermodal cars and long-term storage of maintenance of way cars. There does not appear to be a great deal of day-to-day switching that takes place at Bowles. The industry located at Bowles,

Currently two grade crossings are located within the limits of the segment: Manning Avenue and Springfield Avenue. The former is to be grade-separated with an overhead highway structure and the latter is to be closed. There are no grade crossings planned to remain on the BNSF within this segment.

The surrounding property is private farmland and residential except where the industries are located. Most property is open and uncontrolled, providing direct access from the farm fields and dirt roads that terminate at the BNSF right of way. Access will be more restrictive when South Avenue is closed.

The RHFA for Segment CP0203-03 is 439.24, resulting in a classification of *Unacceptable*. This high-level RHFA is due primarily to the pattern of frequently meeting or crossing-over trains at Bowles, the main track turnouts themselves, the yard and industry switching, and the lack of access control measures along the right-of-way. Installation of an intrusion protection barrier per the requirements of Technical Memorandum 2.1.7 and an access control barrier on the east side of the BNSF alignment to prevent trespassing and vandalism should reduce the RHFA to 337.87, resulting in a classification of *Undesirable*. If it can be demonstrated that the Bowles yard and industries are used so infrequently so as to be considered a negligible hazard, then the RHFA should reduce to 281.56, resulting in a classification of *Tolerable*.

SEGMENT CP0203-04

This segment, approximately 4,000 feet in length, extends from the north limits of the East Switch Bowles to the north limits CP Floral. Figure 7 shows the length of Segment CP0203-04, taken from Floral Road looking north. The CP Floral signals are in the foreground with the controlled signals for the East Switch Bowles in the distance.

Figure 7

The BNSF currently has two main tracks in service at this point. The Bowles siding is a controlled siding, with use authorized by the train dispatcher although it does not appear to be heavily used by through trains. CP Floral is the location where southbound trains are held to meet northbound trains coming off the single-track alignment south of CP Floral, and in fact a meet took place on the day of the site visit with the BNSF train shown in Figure 7 holding for a northbound Amtrak *San Joaquin*.

The BNSF alignment is relatively flat and tangent in this section. There are no grade crossings located in the segment.

The surrounding property is private farmland and residential. Most property is open and uncontrolled, providing direct access from the farm fields and dirt roads that terminate at the BNSF right of way.

The RHFA for Segment CP0203-04 is 304.09, resulting in a classification of *Tolerable*.

SEGMENT CP0203-05

This segment, approximately 1,600 feet in length, encompasses the CP Floral interlocking. The BNSF alignment at this location consists of a main track turnout reducing from two main tracks to the north to one main track to the south. Segment CP0203-05 is shown in Figure 8, taken from Floral Road looking north.

Figure 8

The maximum authorized speed on the Main Track is 79 mph for passenger trains and up to 70 mph for freight trains, with a turnout speed of 50 mph for all types of trains to/from Main Track 1.

The BNSF alignment is relatively flat and tangent in this section. The Floral Road grade crossing is located just south of the control point but is planned to be grade separated over both the CHSRP and BNSF alignments.

The surrounding property is private farmland. Most property is open and uncontrolled, providing direct access from the farm fields and dirt roads that terminate at the BNSF right of way.

The RHFA for Segment CP0203-05 is 337.87, resulting in a classification of *Undesirable*. This medium-level RHFA is due primarily to the pattern of frequently meeting trains at CP Floral, the main track turnout itself, and the lack of access control measures along the right-of-way. Providing increased intrusion protection to the east side of the BNSF right-of-way in the form of access control for pedestrians and appropriate vehicle intrusion protection should reduce the RHFA to 304.09, sufficient to move the classification into the category of *Tolerable*.

SEGMENT CP0203-06

This segment, approximately 3,000 feet in length, extends from a point just south of the present Floral Road grade crossing to the north switch of the Monmouth industries. The BNSF alignment at this location consists of a single main track. Segment CP0203-06 is shown in Figure 9, taken from Floral Road looking south.

Figure 9

The BNSF alignment is relatively flat and tangent in this section. The surrounding property is private farmland. Most property is open and uncontrolled, providing direct access from the farm fields and dirt roads that terminate at the BNSF right of way.

The RHFA for Segment CP0203-06 is 270.30, resulting in a classification of *Tolerable*.

SEGMENT CP0203-07

This segment, approximately 2,500 feet in length, encompasses the Monmouth siding to serve the several industries located there. Segment CP0203-07 is shown in Figure 10a taken from the north switch of the Monmouth siding looking south, and Figure 10b taken from the Nebraska Avenue grade crossing looking north.

Figure 10a

Figure 10b

The BNSF alignment at this location consists of a single main track and a short uncontrolled siding to support service to the Monmouth industries. There appears to be only one industry remaining in Monmouth: Vie-Del company winery and distillery. A hazmat-placarded tank car was spotted on the industry lead on the day of the site visit, although it was unclear whether this car was associated with the industry or not.

The BNSF alignment is relatively flat and tangent in this section. The surrounding property is private farmland to the west and both industrial or residential to the east. Topeka Street fronts the BNSF alignment to the east, but had been severed as a through road just prior to the site visit and did not appear to be re-opening. Property to the west is open and uncontrolled, providing direct access from the farm fields and dirt roads that terminate at the BNSF right of way. Property to the east, if Topeka Street were to be closed, provides a minimal level of access control although both Avenall Avenue and Overholser Avenue terminate at the BNSF right-of-way with appreciable level of intrusion protection for vehicles.

The RHFA for Segment CP0203-07 is 439.24, resulting in a classification of *Unacceptable*. This high-level RHFA is due primarily to the potential for industrial switching and stopping to set out or pick up cars, the two main track turnouts for the short siding, and the lack of access control measures along the right-of-way. If it can be demonstrated that the Monmouth industry or industries are used so infrequently so as to be considered a negligible hazard, then the RHFA should reduce to 337.87, resulting in a classification of *Undesirable*. Installation of an intrusion protection barrier per the requirements of Technical Memorandum 2.1.7 and an access control barrier on the east side of the BNSF alignment to prevent trespassing and vandalism should further reduce the RHFA to 304.09, resulting in a classification of *Tolerable*.

SEGMENT CP0203-08

This segment, approximately 10,500 feet in length, encompasses the main track alignment between Monmouth and Conejo. The BNSF alignment in this segment consists of a single main track with a broad, sweeping curve of 0*30” that does not restrict speed. The segment includes two public at-grade crossings, Chestnut Avenue and Mountain View Avenue. The former is to be closed and the latter is to be grade separated. The segment also includes a trackside warning detector at MP 984.5 and a crossing of an irrigation canal with a 30” box culvert at MP 984.3. Segment CP0203-08 is shown in Figure 11a taken from Chestnut Avenue looking north, and Figure 11b taken of Mountain View Avenue grade crossing looking south.

Figure 11a

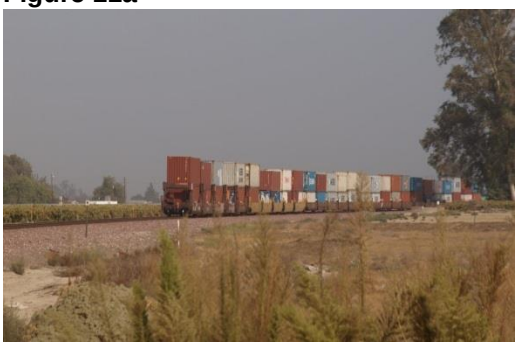


Figure 11b

The RHFA for Segment CP0203-08 is 304.09, resulting in a classification of *Tolerable*.

SEGMENT CP0203-09

This segment, approximately 1,000 feet in length, encompasses the west siding switch at Conejo. The BNSF alignment in this segment consists of a single main track the splits into a main track and siding at the turnout. Turnout speed is 40 MPH. Kamm Avenue terminates at both sides of the BNSF right-of way with only signage for intrusion protection, no barriers. Segment CP0203-09 is shown in Figure 12a looking north and in Figure 12b looking west toward Kamm Avenue.

Figure 12a

Figure 12b

The RHFA for Segment CP0203-09 is 337.87, resulting in a classification of *Undesirable*. Installation of a vehicle intrusion protection barrier per the requirements of Technical Memorandum 2.1.7 should reduce the RHFA to 304.09, resulting in a classification of *Tolerable*.

SEGMENT CP0203-10

This segment, approximately 3,000 feet in length, encompasses the main track and controlled siding alignments at Conejo. The BNSF alignment in this segment is relatively tangent and level and includes several spur tracks serving industries to the east, most notably a rather large perishable warehouse called Imperial West Products and a bulk transload center for grain and liquids. The segment also includes one public at-grade crossing, Conejo Avenue. Segment CP0203-10 is shown in Figure 13a and Figure 13b.

Figure 13a

Figure 3-13b

The CHSRP alignment at this location begins to rise on a raised embankment and/or retained fill in order to cross over the BNSF alignment on an elevated structure south of Conejo Avenue. Because the elevation differential exceeds the 10 foot threshold for nullifying the hazard, the RHFA for Segment CP0203-10 is 0, resulting in a classification of *Eliminated*.

SEGMENT CP0203-11

This segment, approximately 7,000 feet in length, encompasses the CHSRP alignment that crosses over the BNSF main track and controlled siding alignments at Cornejo on a skewed elevated structure.

Because the elevation differential exceeds the 10 foot threshold for nullifying the hazard, and the requirement (satisfied in the 15% drawings for Preliminary Engineering) satisfies the requirement for 25 foot setback from BNSF track center lines for bridge supports (per AREMA standards) the RHFA for Segment CP0203-11 is 0, resulting in a classification of *Eliminated*.

SEGMENT CP0203-12

This segment, approximately 25 miles in length, encompasses the CHSRP alignment that bypasses the City of Hanford to the east. Because the horizontal distance from the CHSRP alignment to the BNSF track center lines exceeds the maximum 125 foot distance for consideration of adjacent railroad hazards the RHFA for Segment CP0203-12 is 0, resulting in a classification of *Eliminated*.

SEGMENT CP0203-13

This segment, approximately 11,000 feet in length, encompasses the BNSF alignment north of Corcoran that is adjacent to SR-43. The BNSF alignment at this location is relatively tangent and level, with no access control measures in place other than signage – persons and vehicles are allowed direct access to the track. Segment CP0203-13 is shown in Figure 14 from the west side looking north east and with SR-43 in the far right of the picture.

Figure 3-14

The CHSRP alignment is to be placed in the strip of land between SR-43 and the BNSF main track. Because the alignment passes through an identified flood plain, the CHSRP track is to be placed on a raised embankment and/or retained fill with an elevation at least 10 feet above the BNSF main track. Despite the fact that the distance to the BNSF track center line is only 75 feet, the elevation differential in excess of 10 feet exceeds the minimum distance required to nullify the hazard, per the ARHRAM model. The RHFA for Segment CP0203-13 is 0, resulting in a classification of *Eliminated*.

SEGMENT CP0203-14

This segment, approximately 25,500 feet in length, encompasses the BNSF alignment through and around the City of Corcoran. The BNSF alignment through town has multiple grade crossings, industry spurs, and a CTC-equipped controlled siding. The alignment is wide open with regards to access control for vehicles and pedestrians. Segment CP0203-14 is shown in Figure 15 from Brokaw Avenue looking south, with the current Amtrak depot on the right and active industrial spurs on the left.

Figure 15

The CHSRP alignment through Corcoran is located to the east of the downtown area in an at-grade configuration, well beyond the maximum 125 foot distance for consideration of adjacent railroad hazards the RHFA for Segment CP0203-12 is 0, resulting in a classification of *Eliminated*.

SEGMENT CP0203-15

This segment, approximately 7,000 feet in length, encompasses the BNSF alignment south of the City of Corcoran and across the Tule River. The BNSF alignment is relatively tangent and level and encounters at-grade crossings at 4th Avenue and Avenue 144. Other than the Tule River Bridge (a ballasted deck, wood pile trestle) there are no main track turnouts or other special trackwork. The alignment is wide open with regards to access control for vehicles and

pedestrians. Segment CP0203-15 is shown in Figure 16a from Avenue 144 looking south toward the Tule River. Figure 16b shows the Tule River Bridge itself.

Figure 16a

Figure 16b

The CHSRP alignment crosses over the BNSF alignment and SR-43 on a long, skewed elevated structure, with support columns projected to be located beyond 25 feet from BNSF track centers. The CHSRP alignment remains elevated over Avenue 144 and the Tule River, landing at grade west of the BNSF alignment south of the Tule River at the current location of the Avenue 136 highway grade crossing (to be closed). Because the elevation differential exceeds the 10 foot threshold for nullifying the hazard, and the requirement (satisfied in the 15% drawings for Preliminary Engineering) satisfies the requirement for 25 foot setback from BNSF track center lines for bridge supports (per AREMA standards) the RHFA for Segment CP0203-15 is 0, resulting in a classification of *Eliminated*.

SEGMENT CP0203-16

This segment, approximately 15,000 feet in length, encompasses the BNSF alignment south of the Tule River to the north siding switch at Angiola. The BNSF alignment is relatively tangent and level and encounters at-grade crossings at Avenue 128 and Avenue 120. There are no main track turnouts or other special trackwork. The alignment is wide open with regards to access control for vehicles and pedestrians. Segment CP0203-16 is shown in Figure 17 from Avenue 120 looking north toward the trackside warning detector at MP 943.7. The CHSRP alignment will be to the left in the photo.

Figure 17

The RHFA for Segment CP0203-16 is 270.30, resulting in a classification of *Tolerable*.

SEGMENT CP0203-17

This segment, approximately 1,000 feet in length, encompasses the BNSF alignment only at the West Siding Switch (directional north) at Angiola. The BNSF alignment is relatively tangent and level and encounters no grade crossings in the segment. There is one main track turnout for the Angiola siding, controlled by the BNSF train dispatcher at the San Bernadino ROC. The alignment is wide open with regards to access control for vehicles and pedestrians, within sight of SR-43. Segment CP0203-17 is shown in Figure 18a, West Siding Switch at Angiola taken from SR-43. Figure 18b looks from the switch south toward the industries at Angiola. The CHSRP alignment will be to the right in the photos.

Figure 18a

Figure 18b

The RHFA for Segment CP0203-17 is 337.87, resulting in a classification of *Undesirable*. This medium-level RHFA is due primarily to the West Siding Switch Angiola where trains frequently meet, and the lack of access control measures along the right-of-way. Providing increased intrusion protection to the east side of the BNSF right-of-way in the form of access control for pedestrians and appropriate vehicle intrusion protection should reduce the RHFA to 304.09, sufficient to move the classification into the category of *Tolerable*.

SEGMENT CP0203-18

This segment, approximately 8,000 feet in length, encompasses the BNSF alignment for the entire length of the Angiola controlled siding. The BNSF alignment is relatively tangent and level and includes a highway-rail grade crossing at Avenue 112, north of the Angiola industries. There is a main track and controlled siding, both controlled by the BNSF train dispatcher at the San Bernadino ROC. The alignment is wide open with regards to access control for vehicles and pedestrians, both from the industries on the west side and SR-43 on the east side. Segment CP0203-18 is shown in Figure 19a from Avenue 112 looking south and in Figure 19b from SR-43 looking north toward the industries at Angiola.

Figure 19a

Figure 19b

The industry on the west side, PFFJ, LLC appears to be a feed mill taking inbound carloads of grain for distribution. The CHSRP alignment is to pass through this area, necessitating the relocation of this industry and removing the main track turnouts and spur tracks. The industry on the east side is derelict and appears to be out of service.

The RHFA for Segment CP0203-17 is 371.66, resulting in a classification of *Unacceptable*. This high-level RHFA is due primarily to the industrial switching activities and main track turnouts presently found at Angiola. Relocating the industries away from the segment should reduce the RHFA to 304.09, sufficient to move the classification into the category of *Tolerable*.

SEGMENT CP0203-19

This segment, approximately 1,000 feet in length, encompasses the BNSF alignment only at the East Siding Switch (directional south) at Angiola. The BNSF alignment is relatively tangent and level and encounters no grade crossings in the segment. There is one main track turnout for the Angiola siding, controlled by the BNSF train dispatcher at the San Bernadino ROC. The alignment is wide open with regards to access control for vehicles and pedestrians, within sight of SR-43. Segment CP0203-19 is shown in Figure 20, East Siding Switch at Angiola taken from SR-43 and with the Angiola industries in the distance to the north. The CHSRP alignment will be to the left in the photo on the far side of the BNSF main track.

Figure 20

The RHFA for Segment CP0203-19 is 337.87, resulting in a classification of *Undesirable*. This medium-level RHFA is due primarily to the East Siding Switch Angiola where trains frequently meet, and the lack of access control measures along the right-of-way. Providing increased intrusion protection to the east side of the BNSF right-of-way in the form of access control for pedestrians and appropriate vehicle intrusion protection should reduce the RHFA to 304.09, sufficient to move the classification into the category of *Tolerable*.

SEGMENT CP0203-20

This segment, approximately 24,000 feet in length, encompasses the BNSF alignment south from the East siding Switch Angiola to just south of the Deer Creek crossing, MP 936.5. The BNSF alignment is relatively tangent and level and encounters only one public highway-rail grade crossing at Avenue 88, MP 938.84. There are no main track turnouts and only one bridge structure at Deer Creek, a ballasted-deck concrete trestle. The alignment is wide open with regards to access control for vehicles and pedestrians, within sight of SR-43. Segment CP0203-20 is shown in Figure 21a from SR-43 and the Deer Creek Bridge is shown in Figure 21b. The CHSRP alignment will be to the left in Figure 21a on the far side of the BNSF main track.

Figure 21a

Figure 21b

The RHFA for Segment CP0203-20 is 270.30, resulting in a classification of *Tolerable*.

SEGMENT CP0203-21

This segment, approximately 24 miles in length, encompasses the CHSRP alignment that bypasses Allensworth State Park to the west. Because the horizontal distance from the CHSRP alignment to the BNSF track center lines exceeds the maximum 125 foot distance for consideration of adjacent railroad hazards the RHFA for Segment CP0203-21 is 0, resulting in a classification of *Eliminated*.

SUMMARY AND RECOMMENDATIONS

The results of the ARHRAM analysis for CP02-03 are summarized in Figure 4-1.

Figure 4-1 -- Summary ARHRAM Analysis

Section CP02-03, East American Avenue to the Kern County Line
BNSF MP 992.0 to MP 917.0

Assessment Date: 9/5/2014

Segment	CHSRP Stationing		Length (ft)	RHFA	Classification	Code	Acceptance Criteria	Notes
1	600	728	12,800	337.87	Remote		Undesirable	Approach to Bowles crossover, minimal access control
2	728	754	2,600	371.66	Occasional		Unacceptable	West Bowles Crossover
3	754	844	9,900	439.24	Occasional		Unacceptable	Industry/yard tracks and broad curve, to be re-aligned
4	844	884	4,000	304.09	Highly Unlikely		Tolerable	East Bowles/Floral meeting point
5	884	900	1,600	337.87	Remote		Undesirable	CP Floral, two tracks to one
6	900	930	3,000	270.30	Highly Unlikely		Tolerable	
7	930	955	2,500	439.24	Occasional		Unacceptable	Industrial trackage, open access to public streets
8	955	1060	10,500	304.09	Remote		Undesirable	CHSTS on outside of broad curve
9	1060	1070	1,000	337.87	Highly Unlikely		Tolerable	West siding switch Conejo
10	1070	1100	3,000	0.00	Null		Eliminated	CHSTS on raised embankment/retained fill
11	1100	1160	6,000	0.00	Null		Eliminated	CHSTS on elevated trainway crossing over BNSF
12	1160	2525	136,500	0.00	Null		Eliminated	CHSTS bypass Hanford to the east
13	2525	2635	11,000	0.00	Null		Eliminated	CHSTS on raised embankment/retained fill above flood plain
14	2635	2990	25,500	0.00	Null		Eliminated	Corcoran bypass east of town
15	2990	3060	7,000	0.00	Null		Eliminated	CHSTS on elevated trainway to cross BNSF and SR-43
16	3060	3210	15,000	270.30	Highly Unlikely		Tolerable	
17	3210	3220	1,000	337.87	Remote		Undesirable	West siding switch Angiola
18	3220	3300	8,000	371.66	Occasional		Unacceptable	Angiola industries/yard tracks to be relocated
19	3300	3310	1,000	337.87	Remote		Undesirable	East siding switch Angiola
20	3310	4010	24,000	270.30	Highly Unlikely		Tolerable	
21	4010	5270	126,000	0.00	Null		Eliminated	Allensworth bypass west of the State Park

In summary, of the twenty-one segments assessed, four were found to contain characteristics that result in a hazard risk that is ***Unacceptable***. The results of the hazard analysis suggest that the Authority should install intrusion protection barriers consistent with the requirements of *Technical Memorandum 2.1.7 Rolling Stock and Highway Vehicle Intrusion Protection for High-Speed Rail* in the *Unacceptable* segments in order to mitigate the hazard risk. The assessment of post-mitigation conditions will be required to confirm that the residual hazard risk is acceptable to the Authority. Several of the segments with BNSF yards and/or industries, however, can be downgraded in their risk assessments if it can be demonstrated that the yards and/or industries are either out of service or used so infrequently as to effectively consider them to be of no risk. These segments include CP0203-03 at Bowles, CP0203-07 at Monmouth, and CP0203-18 at Angiola.

Five segments were found to contain characteristics that result in hazard risk that is classified as ***Undesirable***. The hazard risk in these segments can be accepted only where further risk reduction is impracticable. Alternative changes to the physical or operating characteristics of the adjacent railroad and surrounding corridor should be considered and discussed with the railroad for the *Undesirable* segments. If alternative railroad characteristics are not practicable, then the Authority can make the decision to accept the residual hazard risk. Acceptance of the hazard risk lies ultimately lies only with the California High-Speed Rail Authority.

Five segments were found to contain characteristics that result in a hazard risk that is ***Tolerable***. The hazard risk in these segments should be acceptable with review by the Authority.

Finally, seven segments were found to not contain a hazard risk due to the distance of track center lines between the CHSRP trainway and the adjacent railroad greater than 125 feet or an elevation differential in favor of the CHSRP alignment greater than 10 feet.

APPENDIX A – ARHRAM WORKSHEETS AND FIELD NOTES

ARHRAM Worksheet

Location CP0203-01
CHSR Stationing 600 to 728, 12800 feet

Railroad BNSF

RR Mileposts	992.0	989.5
RR Derailment Rate	2.03	

Field Visit John Cockle
Date: 10/9/2013
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Northern approach to West Bowles crossover for meeting/passing trains.	0.1
Special trackwork	None	0
Movement Authorization	2 MT CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Farm fields on either side with no fence, public grade crossing	0
Highway-grade crossing	Multiple grade crossings to be closed or grade separated, none to remain.	0
Train defect detectors	Closest TWD at MP 984.5	0
	Total Plus Base Condition of (1)	1
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA 337.87

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "M"
- Grade Crossings: Lincoln Ave to be OH, Clayton Ave to be closed, Adams Ave to be OH

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location	CP Ø203-Ø1 E. American to W. Bowles X-over		Assessment By:	John Cockle
CHSR Stationing	600 + 728, 12,800 ft.		Date:	10/9/2013 visit
			Reviewed By:	
Railroad	BNSF ~~992.0~~ 992.0 989.5		Date:	
RR Mileposts			Accepted by:	
RR Derailment Rate	2-Ø3 ~~0.000000966~~		Date:	

Number of annual trains	38 ~~X~~		SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent ✓	Ø 0
Vertical Alignment	Level ✓	Ø 0
Type of Movement	~~Through movement, no stops~~ meet/pass at W. Bowles X-over	.1 ~~0~~
Special trackwork	None ✓	Ø 0
Movement Authorization	~~Other than main track~~ CTC	-.1 ~~0~~
Access to right-of-way	Open Farm field on both sides w/no fence	Ø 0
Highway-grade crossing	~~None~~ Lincoln Ave to be OH Clayton to be closed Adams to be OH	Ø 0
Train defect detectors	None Closest TWD @ MP 894.5	Ø 0
	Total Plus Base Condition of (1)	1.0 ~~1~~ 1.Ø
Effect Factors		
Horizontal Alignment	Tangent ✓	Ø 0
Speed	~~Less than 20 MPH~~ 70 mph	.2 ~~0~~
Horizontal Distance	Greater than 102 ft.	Ø 0
Elevation relative to CHSR	At-grade ✓	Ø 0
Adjacent structure	None ✓	Ø 0
Overhead Structure	None ✓	Ø 0
	Total Plus Base Condition of (1)	1.2 ~~1~~ 1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA: 337.87 ~~0.01~~

Notes

~~– Fut. MP 992.0 to 989.5~~
~~– Includes Xover and WSW Bowles~~

ARHRAM Worksheet

Location	CP0203-02, West Bowles	Field Visit	John Cockle
CHSR Stationing	728 to 754, 2600 feet	Date:	10/9/2013
		Assessment by:	
Railroad	BNSF	Date:	
RR Mileposts	989.5 / 989.0		
RR Derailment Rate	2.03	Signature:	

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	West Bowles crossover is a location for meeting/passing trains.	0.1
Special trackwork	West Bowles crossover and WSW Bowles siding	0.2
Movement Authorization	2 MT CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Farm fields on either side with no fence, public grade crossing	0
Highway-grade crossing	South Ave to be grade separated	0
Train defect detectors	TWD at MP 984.5	-0.1
	Total Plus Base Condition of (1)	1.1
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA	371.66

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "M"
- Grade crossings: South Ave MP 989.3 to be OH
- BNSF to be realigned slightly to the East, assumed to be lateral distance from CHSTS greater than 102 feet.

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP Z03-02 W. X-over Bowles
CHSR Stationing: 728 + 754, 26 FT

Railroad: BNSF 989.5 989.0
RR Mileposts:
RR Derailment Rate: 2.03 ~~0.000000966~~

Assessment By: John Cockle
Date: 10/9/2013 WBT
Reviewed By:
Date:
Accepted by:
Date:

Number of annual trains	38 1	SSDF	0.0000

Category	Site-Specific Characteristics		Rating
Causal Factors			
Horizontal Alignment	**Tangent** ✓		Ø 0
Vertical Alignment	**Level** ✓		Ø 0
Type of Movement	~~Through-movement, no stops~~ Meet/Pass		.1
Special trackwork	~~None~~ X-over and WSW Bowles		.2
Movement Authorization	~~Other than main track~~ CTC		-.1 0
Access to right-of-way	**Open** Farm fields on both sides w/no fence		Ø 0
Highway-grade crossing	~~None~~ South Ave to be OH, just @ Bowles Xover		Ø 0
Train defect detectors	**None** TWD @ MP 989.5		-.1
		Total Plus Base Condition of (1)	~~1~~ 1.1
Effect Factors			
Horizontal Alignment	**Tangent** ✓		Ø 0
Speed	**Less than 20 MPH** 70 mph		.2 0
Horizontal Distance	**Greater than 102 ft.** ✓		Ø 0
Elevation relative to CHSR	**At-grade** Even		Ø 0
Adjacent structure	**None** ✓		Ø 0
Overhead Structure	**None** ✓		Ø 0
		Total Plus Base Condition of (1)	1 1.2

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA: 371.66 ~~0.01~~

Notes
- W. Xover Bowles 989.5 and WSW Bowles
- Est MP 989.0 & MP 989.5
- BNSF to be realigned to (E), assume greater than 102 ft separation

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location	CP0203-03, Bowles Yard	Field Visit	John Cockle
CHSR Stationing	754 to 844, 9900 feet	Date:	10/9/2013
		Assessment by:	
Railroad	BNSF	Date:	
RR Mileposts	989.0 / 987.3		
RR Derailment Rate	2.03	Signature:	

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Very broad curve, not sharp enough to restrict speed.	0
Vertical Alignment	Level	0
Type of Movement	South approach to West Bowles crossover. Also industry/yard setouts.	0.3
Special trackwork	Industry/yard turnouts from MT.	0.2
Movement Authorization	2 MT CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Farm fields on either side with no fence, public grade crossing	0
Highway-grade crossing	Manning Ave to be grade separated, Springfield Ave to be closed.	0
Train defect detectors	TWD at MP 984.5	-0.1
	Total Plus Base Condition of (1)	1.3
Effect Factors		
Horizontal Alignment	Very broad curve, not sharp enough to restrict speed.	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA	439.24

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "M"
- Grade crossings: Manning Ave MP 988.28, Springfield Ave MP 987.78
- BNSF to be realigned to the East of current alignment, assumed to be lateral distance from CHSTS greater than 102
- BNSF Yard at Bowels assumed to be rebuilt.

ARHRAM Worksheet

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

Location	CP 02-03 Bowles Siding	Assessment By:	John Cockle
CHSR Stationing	754 + 844, 9900 ft.	Date:	10/9/2013 visit
		Reviewed By:	
Railroad	BNSF 989.0 987.3	Date:	
RR Mileposts		Accepted by:	
RR Derailment Rate	2.03 ~~0.000000966~~	Date:	

Number of annual trains	38	SSDF	0.0000

Category	Site-Specific Characteristics	Notes	Rating	
Causal Factors				
Horizontal Alignment	Tangent ✓	Broad curve to the (E) Not speed restricting	~~0~~	0
Vertical Alignment	Level ✓		~~0~~	0
Type of Movement	Through movement, no stops	Setout/Industry and meets at CP	.3	0
Special trackwork	~~None~~	Ind. track to packing house (W) side to BNSF ... New yard tracks	.2	0
Movement Authorization	~~Other than main track~~	CTC	-.1	0
Access to right-of-way	Open	Farm field on both sides w/no fencing	~~0~~	0
Highway-grade crossing	~~None~~	Springfield X to be closed Manning to be OH	~~0~~	0
Train defect detectors	None	MP 984.5	-.1	0
		Total Plus Base Condition of (1)		1 (1.3)
Effect Factors				
Horizontal Alignment	~~Tangent~~	HST on outside of curve Not speed restricting	~~0~~	0
Speed	~~Less than 50 MPH~~	70 mph	.2	0
Horizontal Distance	Greater than 102 ft. ✓		0	0
Elevation relative to CHSR	At-grade ✓		~~0~~	0
Adjacent structure	None ✓		~~0~~	0
Overhead Structure	None ✓		~~0~~	0
		Total Plus Base Condition of (1)		1 (1.2)

Yard Tracks (W) side (S) of Manning Ave.

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA 439.24 ~~0.01~~

Notes

- WSW Bowles siding to start of curve just (S) of Manning Ave.
- BNSF to be realigned (E) of present alignment to flatten curve, HSR to be in and (E) of present BNSF alignment.
- Current yard tracks to be built on (E) side of new alignment.
- Springfield Grade Xing to close

Rev 0.1_BNSF_09/27/2013

ARHRAM Worksheet

Location **CP0203-04, East Bowles**
CHSR Stationing **844 to 884, 4000 feet**

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:

Railroad **BNSF**

RR Mileposts	987.3	986.5
RR Derailment Rate	2.03	

Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Meeting point at Floral, 2 MT down to 1 MT.	0.1
Special trackwork	None	0
Movement Authorization	2 MT CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Farm fields on either side with no fence, street access to yard, public grade crossing	0
Highway-grade crossing	None	0
Train defect detectors	TWD at MP 984.5	-0.1
	Total Plus Base Condition of (1)	0.9
Effect Factors		
Horizontal Alignment	Very broad curve, not enough to be a factor.	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA **304.09**

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "M"
- Grade crossings: Manning Ave MP 988.28, Springfield Ave MP 987.78
- BNSF to be realigned to the East of current alignment, assumed to be lateral distance from CHSTS greater than

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location	CP02-04	Assessment By:	John Cockle
CHSR Stationing	844 to 884, 4000 ft	Date:	10/3/2013 visit
		Reviewed By:	
Railroad	BNSF 982.3 986.5	Date:	
RR Mileposts		Accepted by:	
RR Derailment Rate	2.83 ~~0.000000966~~	Date:	

Number of annual trains	38 ~~2~~	SSDF	0.0000

Category	Site-Specific Characteristics		Rating
Causal Factors			
Horizontal Alignment	**Tangent**	0	0
Vertical Alignment	**Level**	0	0
Type of Movement	**Through movement, no stops** Meeting point and Pilot	0.1	0
Special trackwork	**None** ✓	0	0
Movement Authorization	~~**Other than main track**~~ CTC	-.1	0
Access to right-of-way	**Open** Farm fields w/out fence Open access to yard	0	0
Highway-grade crossing	**None** ✓	0	0
Train defect detectors	**None** ✓ MP 984.5	-.1	0
	Total Plus Base Condition of (1)		1 (0.9)
Effect Factors			
Horizontal Alignment	**Tangent** ✓	0	0
Speed	**Less than 20 MPH** 70 mph	.2	0
Horizontal Distance	**Greater than 102 ft.**	0	0
Elevation relative to CHSR	**At-grade**	0	0
Adjacent structure	**None**	0	0
Overhead Structure	**None**	0	0
	Total Plus Base Condition of (1)		1 (1.2)

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA	304.09 ~~0.01~~

Notes

ARHRAM Worksheet

Location **CP0203-05, CP Floral**
CHSR Stationing **884 to 900, 1600 feet**

Railroad **BNSF**

RR Mileposts	896.5	896.2
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	**38**	SSDF	**28156.1000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**Meeting point at Floral, 2 MT down to 1 MT.**	**0.1**
Special trackwork	**Single dual-control switch**	**0.1**
Movement Authorization	**2 MT CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open - Farm fields on either side with no fence, public grade crossing**	**0**
Highway-grade crossing	**Foral Ave. to be OH**	**0**
Train defect detectors	**TWD at MP 984.5**	**-0.1**
	Total Plus Base Condition of (1)	**1**
Effect Factors		
Horizontal Alignment	**Very broad curve, not enough to be a factor.**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to OG	**3-4 above OG**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1.2**

Horizontal Distance	**Less than 125 ft.**	**1**
Horizontal/Vertical Separation	**None**	**1**

RHFA **337.87**

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "M"
- Grade crossings: none
- BNSF to be realigned to the East of current alignment, assumed to be lateral distance from CHSTS greater than 102

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ARHRAM Worksheet

Location: CP02 - 05 CP Floral
CHSR Stationing: 884 to 900, 1600 ft.

Railroad: BNSF 986.5 986.2
RR Mileposts:
RR Derailment Rate: 2.83 ~~0.000000966~~

Assessment By: John Cockle
Date: 10/9/2013
Reviewed By:
Date:
Accepted by:
Date:

Number of annual trains	38 ~~1~~	SSDF	0.0000

Category	Site-Specific Characteristics		Rating
Causal Factors			
Horizontal Alignment	**Tangent** ✓		~~0~~ 0
Vertical Alignment	**Level** ✓		~~0~~ 0
Type of Movement	**Through movement, no stops**	Meeting Point	.1 0
Special trackwork	~~None~~	DCS - one MT to 2 MT	.1 0
Movement Authorization	~~Other than main track~~	CTC	-.1 0
Access to right-of-way	**Open**	Farm fields on either side Public grade xing	~~0~~ 0
Highway-grade crossing	**None**	Floral Ave to be OH	~~0~~ 0
Train defect detectors	**None**	TWD @ MP 984.5	-.1 0
		Total Plus Base Condition of (1)	1
Effect Factors			
Horizontal Alignment	**Tangent** ✓		0
Speed	~~Less than 40 MPH~~	70 MPH	.2 0
Horizontal Distance	**Greater than 102 ft.** ✓		0
Elevation relative to CHSR	**At-grade** ✓		0
Adjacent structure	**None** ✓		0
Overhead Structure	**None** ✓		0
		Total Plus Base Condition of (1)	1

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA: 337.87 ~~0.01~~

Notes

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ARHRAM Worksheet

Location **CP0203-06**
CHSR Stationing **900 to 930, 3000 feet**

Railroad **BNSF**

RR Mileposts	986.3	985.6
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:

Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	0
Vertical Alignment	**Level**	0
Type of Movement	**Through movement, no stops**	0
Special trackwork	**None**	0
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	-0.1
Access to right-of-way	**Open - Farm fields on either side with no fence**	0
Highway-grade crossing	**None**	0
Train defect detectors	**TWD @ MP 984.5**	-0.1
	Total Plus Base Condition of (1)	0.8
Effect Factors		
Horizontal Alignment	**Tangent**	0
Speed	**70 MPH for freight trains**	0.2
Horizontal Distance	**Greater than 102 ft.**	0
Elevation relative to OG	**3-4 above OG**	0
Adjacent structure	**None**	0
Overhead Structure	**None**	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA **270.30**

Notes

- Site visit 10/9/2013 w/A.Marquez	**CHSTS Preliminary Alignment "M"**

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ARHRAM Worksheet

Location CP82-86
CHSR Stationing 900 to 930 3000 ft.

Railroad BNSF 986-3 ~~985-6~~
RR Mileposts
RR Derailment Rate 2.03 ~~0.000000966~~

Assessment By: John Cockle
Date: 10/9/2012 visit
Reviewed By:
Date:
Accepted by:
Date:

Number of annual trains	38 ~~1~~	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	~~0~~ 0
Vertical Alignment	**Level** ✓	~~0~~ 0
Type of Movement	**Through movement, no stops** ✓ C	~~0~~ 0
Special trackwork	**None** ✓	~~0~~ 0
Movement Authorization	**Other than main track** CTC	-.1 0
Access to right-of-way	**Open** ✓	~~0~~ 0
Highway-grade crossing	**None** ✓	~~0~~ 0
Train defect detectors	**None** THD @ MP 894.5	-.1 ✓
	Total Plus Base Condition of (1)	1

Ø.8

Effect Factors		
Horizontal Alignment	**Tangent**	~~0~~ 0
Speed	**Less than 20 MPH** 70 MPH	.2 0
Horizontal Distance	**Greater than 102 ft.**	~~0~~ 0
Elevation relative to CHSR	**At-grade**	~~0~~ 0
Adjacent structure	**None**	~~0~~ 0
Overhead Structure	**None**	~~0~~ 0
	Total Plus Base Condition of (1)	1

1.2

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA 2.03 ~~0.01~~

Notes

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ARHRAM Worksheet

Location **CP0203-07 Monmouth**
CHSR Stationing **930 to 955, 2500 feet**

Railroad **BNSF**

RR Mileposts	985.6	985.2
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	**38**	SSDF	**28156.1000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**Run-around and industrial trackage.**	**0.3**
Special trackwork	**Two MT turnouts for industrial run-around.**	**0.2**
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open - Farm fields west side with no fence, industrial facility on east but also public streets.**	**0**
Highway-grade crossing	**Nebraska Ave. to be OH grade separation**	**0**
Train defect detectors	**TWD @ MP 984.5**	**-0.1**
	Total Plus Base Condition of (1)	**1.3**
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to OG	**3-4 above OG**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1.2**

Horizontal Distance	**Less than 125 ft.**	**1**
Horizontal/Vertical Separation	**None**	**1**

RHFA **439.24**

Notes

- **Industries at Monmouth look to be used infrequently, although tank car was spotted on the spur on day of visit. Need to confirm amount of activitity w/BNSF.**
- **Grade crossing: Nebraska Ave, MP 985.23**

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ARHRAM Worksheet

Location: CP02-07 Monmouth
CHSR Stationing: 930 to 955, 2500 ft.

Railroad: BNSF
RR Mileposts: 985.6 | 985.2
RR Derailment Rate: 2.03 ~~0.000000966~~

Assessment By: John Cockle
Date: 10/9/2013 visit
Reviewed By:
Date:
Accepted by:
Date:

Number of annual trains	38 1	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	~~0~~ 0
Vertical Alignment	**Level** ✓	~~0~~ 0
Type of Movement	**Through movement, no stops** ✓	.3 0
Special trackwork	~~None~~ Run-around and industry spur	.2 0
Movement Authorization	~~Other than main track~~ CTC	-.1 0
Access to right-of-way	**Open** ✓	~~0~~ 0
Highway-grade crossing	~~None~~ Nebraska Ave to be OP	~~0~~ 0
Train defect detectors	**None** MP 984.5	-.1 0
	Total Plus Base Condition of (1)	~~1~~ 1.3
Effect Factors		
Horizontal Alignment	**Tangent**	~~0~~ 0
Speed	**Less than 20 MPH** 70 mph	.2 0
Horizontal Distance	**Greater than 102 ft.**	~~0~~ 0
Elevation relative to CHSR	**At-grade**	~~0~~ 0
Adjacent structure	**None**	0 0
Overhead Structure	**None**	0 0
	Total Plus Base Condition of (1)	~~1~~ 1.2

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA: 439.24 ~~0.01~~

Notes

- Monmont Sdg, 985.6, 1324 ft.
- Nebraska Ave. MP 985.23

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ARHRAM Worksheet

Location	CP0203-08 Monmouth Curve	Field Visit	John Cockle
CHSR Stationing	955 to 1060, 10500 feet	Date:	10/9/2013
		Assessment by:	
Railroad	BNSF	Date:	
RR Mileposts	985.2 / 983.2		
RR Derailment Rate	2.03	Signature:	

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	BNSF to be realigned with big, broad curve. Curve not sharp enough to restrict speed.	0
Vertical Alignment	Level	0
Type of Movement	North approach to Conejo siding	0.1
Special trackwork	None	0
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Farm fields both sides, public dump (county?) on west side just north of Monmouth.	0
Highway-grade crossing	Chestnut Ave to be closed, Mountain View Ave to be OH grade separated.	0
Train defect detectors	TWD @ MP 984.5	-0.1
	Total Plus Base Condition of (1)	0.9
Effect Factors		
Horizontal Alignment	CHSTS on inside of re-aligned curve, curve not sharp enough to restrict speed.	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA	304.09

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "M"
- Big, broad curve to the east to be flattened even more than it is now during the re-alignment.
- Grade crossings: Chestnut Ave MP 984.41, Mountain View Ave MP 984.19.
- Irrigation canal crossed at MP 984.60 to be rebuilt as box culvert MP 984.45.
- Trackside Warning Detector MP 984.5, DED

ARHRAM Worksheet

Location	CP02-8 Monmouth & Conejo	Assessment By:	John Cockle
CHSR Stationing	955 to 1060 10500 ft.	Date:	10/9/2013 visit
		Reviewed By:	
Railroad	BNSF 985.2 983.2	Date:	
RR Mileposts		Accepted by:	
RR Derailment Rate	2.03 ~~0.000000066~~	Date:	

Number of annual trains	38 ~~1~~	SSDF	0.0000

Category	Site-Specific Characteristics	Rating	
Causal Factors			
Horizontal Alignment	**Tangent** ✓ Big broad curve to be realigned flatter than it is now. Not speed restricting	Ø	0
Vertical Alignment	**Level** ✓	Ø	0
Type of Movement	~~**Through movement, no stops**~~ North approach & Conejo siding	.1	0
Special trackwork	**None** ✓	Ø	0
Movement Authorization	~~**Other than main track**~~ CTC	-.1	0
Access to right-of-way	**Open**	Ø	0
Highway-grade crossing	None – Chestnut to be closed – Mtn View to be OH	Ø	0
Train defect detectors	~~None~~ MP 984.4	-.1	0
	Total Plus Base Condition of (1)		1 (0.9)
Effect Factors			
Horizontal Alignment	**Tangent** CHST on outside of realigned curve - Not speed restricting	Ø	0
Speed	**Less than 20 MPH** 70 MPH	.2	0
Horizontal Distance	**Greater than 102 ft.** ✓	Ø	0
Elevation relative to CHSR	**At-grade** ✓	Ø	0
Adjacent structure	**None** ✓	Ø	0
Overhead Structure	**None** ✓	Ø	0
	Total Plus Base Condition of (1)		1 (1.2)

Horizontal Distance	**Less than 125 ft.** ✓	1
Horizontal/Vertical Separation	**None** ✓	1

RHFA 304.09 0.01

Notes

- (S) of Nebraska
- BNSF to be realigned to (E) & flatter curve
- Big broad curve to (E) to be flattered even more than it is now.
- Chestnut Xing 984.41, Mtn View Xing MP 984.19
- Canal realignment

ARHRAM Worksheet

Location **CP0203-09 WSW Conejo**
CHSR Stationing **1060 to 1070, 1000 feet**

Railroad **BNSF**

RR Mileposts	983.2	983.0
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:

Signature:

Number of daily trains (average)	**38**	SSDF	**28156.1000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**West Switch Conejo, meeting/passing siding**	**0.1**
Special trackwork	**Dual control switch**	**0.1**
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open - Farm fields both sides. Kamm Ave terminates at BNSF alignment.**	**0**
Highway-grade crossing	**None**	**0**
Train defect detectors	**TWD @ MP 984.5**	**-0.1**
	Total Plus Base Condition of (1)	**1**
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to OG	**3-4 above OG**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1.2**

Horizontal Distance	**Less than 125 ft.**	**1**
Horizontal/Vertical Separation	**None**	**1**

RHFA **337.87**

Notes

- **Site visit 10/9/2013 w/A.Marquez** **CHSTS Preliminary Alignment "H"**
- **Big, broad curve to the east to be flattened even more than it is now during the re-alignment.**
- **Grade crossings: none, although Kamm Avenue formerly crossed in the turnout and terminates on both sides.**
- **Trackside Warning Detector MP 984.5, DED**

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ARHRAM Worksheet

Location	CP 02-9 WSW Camp	
CHSR Stationing	1060 to 1070, 1000 ft.	
Railroad	BNSF 983.2	983.0
RR Mileposts		
RR Derailment Rate	2.03 ~~0.000000966~~	

Assessment By:	John Cockle
Date:	10/9/2013
Reviewed By:	
Date:	
Accepted by:	
Date:	

Number of annual trains	38	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Vertical Alignment	**Level** ✓	Ø 0
Type of Movement	**Through movement, no stops** Passing Siding	.1 0
Special trackwork	~~**None**~~ Dual Control Switch	.1 0
Movement Authorization	**Other than main track** CTC	-.1 0
Access to right-of-way	**Open** — Kamm Ave to both sides of BNSF	Ø 0
Highway-grade crossing	**None** ✓	Ø 0
Train defect detectors	None MP 984.5	-.1 0
	Total Plus Base Condition of (1)	1 (1.Ø)
Effect Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Speed	~~Less than 20 MPH~~ 70 mph	.2 0
Horizontal Distance	**Greater than 102 ft.** ✓	Ø 0
Elevation relative to CHSR	**At-grade** ✓	Ø 0
Adjacent structure	**None** ✓	Ø 0
Overhead Structure	**None** ✓	Ø 0
	Total Plus Base Condition of (1)	1 (1.2)

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA: 337.87 ~~0.01~~

Notes

- Grade crossings: None although Kamm Ave used to cross at turnout and now terminates on both sides of BNSF w/very little protection/warning.

- TWD 984.5

ARHRAM Worksheet

Location **CP0203-10 Conejo Siding**
CHSR Stationing **1070 to 1100, 3000 feet**

Railroad **BNSF**

RR Mileposts	983.0	981.5
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Conejo passing siding, active industries on east side at north side of town.	0.3
Special trackwork	Industry and storage yard turnouts	0.2
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Farm fields both sides. Industry with limited access on the east side of BNSF south of Conejo Ave.	0
Highway-grade crossing	None	0
Train defect detectors	TWD @ MP 984.5	-0.1
	Total Plus Base Condition of (1)	1.3
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	CHSTS on raised embankment/retained fill in order to cross BNSf and Conejo Ave in Section CP02-11	0

RHFA **0.00**

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "H"
- Industries on east side north of Conejo Ave: Imperial West Products, other?
- Grade crossings: Conejo Ave MP 982.10
- Setout tracks located east of siding MP 981.9 to 981.65
- Trackside Warning Detector MP 984.5, DED

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ARHRAM Worksheet

Location **CP0203-10 Conejo Siding**
CHSR Stationing **1070 to 1100, 3000 feet**

Railroad **BNSF**

RR Mileposts	983.0	981.5
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Conejo passing siding, active industries on east side at north side of town.	0.3
Special trackwork	Industry and storage yard turnouts	0.2
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Farm fields both sides. Industry with limited access on the east side of BNSF south of Conejo Ave.	0
Highway-grade crossing	None	0
Train defect detectors	TWD @ MP 984.5	-0.1
	Total Plus Base Condition of (1)	1.3
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	CHSTS on raised embankment/retained fill in order to cross BNSf and Conejo Ave in Section CP02-11	0

RHFA **0.00**

Notes

- Site visit 10/9/2013 w/A.Marquez CHSTS Preliminary Alignment "H"
- Industries on east side north of Conejo Ave: Imperial West Products, other?
- Grade crossings: Conejo Ave MP 982.10
- Setout tracks located east of siding MP 981.9 to 981.65
- Trackside Warning Detector MP 984.5, DED

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location	CP Ø203-1Ø Conejo	Assessment By:	John Cockle
CHSR Stationing	1070 to 1100, 3000 ft.	Date:	10/9/2013
		Reviewed By:	
Railroad	BNSF 983.0 982.3	Date:	
RR Mileposts		Accepted by:	
RR Derailment Rate	2.Ø3 ~~0.000000956~~	Date:	

Number of annual trains	38 ~~1~~	SSDF	**0.0000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Vertical Alignment	**Level** ✓	Ø 0
Type of Movement	**Through movement, no stops** Passing Siding Industries	.3 0
Special trackwork	~~**None**~~ Siding Turnouts	.2 0
Movement Authorization	**Other than main track** CTC	-.1 0
Access to right-of-way	**Open** ✓ Industry on (E) side Almond orchards on (W) side	Ø 0
Highway-grade crossing	**None**	Ø 0
Train defect detectors	~~**None**~~ MP 984.5	-.1 0
	Total Plus Base Condition of (1)	**1** (1.3)
Effect Factors		
Horizontal Alignment	**Tangent**	Ø 0
Speed	~~Less than 20 MPH~~ 70 mph	.2 0
Horizontal Distance	**Greater than 102 ft.**	Ø 0
Elevation relative to CHSR	**At-grade**	Ø 0
Adjacent structure	**None** ✓	Ø 0
Overhead Structure	**None** ✓	Ø 0
	Total Plus Base Condition of (1)	**1** (1.2)

Horizontal Distance	**Less than 125 ft.**	**1**
Horizontal/Vertical Separation	**None** CHSTS elevated to cross BNSF and Conejo Ave	Ø **1** (Ø) ~~1~~

RHFA Ø ~~**0.01**~~

Notes

- Industries on (E) side: Imperial West Products - Rt of (N) of Conejo Ave
- Conejo Ave King 982.10
- Willow Ave terminates at BNSF
- Setout tracks off siding MP 981.9 - 981.65

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location **CP0203-11 Conejo OH Crossing**
CHSR Stationing **1070 to 1140, 7000 feet**

Railroad **BNSF**

RR Mileposts	983.0	981.5
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:

Signature:

Number of daily trains (average)	**38**	SSDF	**28156.1000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**Conejo passing siding, active industries on east side at north side of town.**	**0.3**
Special trackwork	**Industry and storage yard turnouts**	**0.2**
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open - Farm fields both sides. Industry with limited access on the east side of BNSF south of Conejo Ave.**	**0**
Highway-grade crossing	**Conejo Ave. and Peach Ave. grade crossings to remain on BNSF. CHSTS to cross on OH.**	**0.3**
Train defect detectors	**TWD @ MP 984.5**	**-0.1**
	Total Plus Base Condition of (1)	**1.6**
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to OG	**CHSTS elevated to cross BNSF and Conejo Ave. both.**	**-0.4**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**0.8**

Horizontal Distance	**Less than 125 ft.**	**1**
Horizontal/Vertical Separation	**CHSTS on elevated trainway greater than 20 feet above BNSF alignment in order to cross over BNSF.**	**0**

RHFA **0.00**

Notes

- **Site visit 10/9/2013 w/A.Marquez** **CHSTS Preliminary Alignment "H"**
- **Industries on east side north of Conejo Ave: Imperial West Products, other?**
- **Grade crossings: Conejo Ave MP 982.10**
- **Setout tracks located east of siding MP 981.9 to 981.65**
- **Trackside Warning Detector MP 984.5, DED**

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CD0283-11 ESW Conejo
CHSR Stationing: 1100 + 1160 6000 ft.

Railroad: BNSF 982-3 981.3
RR Mileposts:
RR Derailment Rate: 2.83 ~~0.000000966~~

Assessment By: John Cockle
Date: 10/9/2013 visit
Reviewed By:
Date:
Accepted by:
Date:

Number of annual trains	38 ~~1~~	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	~~0~~ 0
Vertical Alignment	**Level** ✓	~~0~~ 0
Type of Movement	~~**Through-movement, no stops**~~ Setout tracks Passing siding	.3 0
Special trackwork	~~None~~ Yard Track switches ESW Conejo, Dual Control Switch	.2 0
Movement Authorization	~~Other than main track~~ CTC	-.1 0
Access to right-of-way	**Open**	~~0~~ 0
Highway-grade crossing	~~None~~ Conejo Ave & Stry Peach Ave & Story	.3 0
Train defect detectors	None MP 384.5	-.1 0
	Total Plus Base Condition of (1)	~~1~~ 1.6
Effect Factors		
Horizontal Alignment	**Tangent** ✓	~~0~~ 0
Speed	~~Less than 20 MPH~~ 70 MPH	.2 0
Horizontal Distance	**Greater than 102 ft.** ✓	~~0~~ 0
Elevation relative to CHSR	At-grade CHST elevated to cross BNSF	-.4 0
Adjacent structure	**None** ✓	~~0~~ 0
Overhead Structure	**None** ✓	~~0~~ 0
	Total Plus Base Condition of (1)	~~1~~ 0.8
Horizontal Distance	~~Less than 125 ft.~~ Greater than HSR to the east	~~0~~ 1 (0)
Horizontal/Vertical Separation	**None**	1

RHFA: ~~0.01~~ 0

Notes:
- Site visit 10/9/2013
- Conejo Ave MP 982.10, Peach Ave MP 981.34
- Willow Ave terminates at BNSF yard on (E) side
- Setout tracks off siding MP 981.9 to 981.65

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location **CP0203-12 Hanford East Bypass**
CHSR Stationing **1160 to 2525, 136500 feet (approx. 25 miles)**

Railroad **BNSF**

RR Mileposts	981.5	956.0
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/9/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**Through movement, no stops**	**0**
Special trackwork	**None**	**0**
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open**	**0**
Highway-grade crossing	**None**	**0**
Train defect detectors	**None**	**0**
	Total Plus Base Condition of (1)	**0.9**
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to OG	**3-4 above OG**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1.2**

Horizontal Distance	**Less than 125 ft.**	**0**
Horizontal/Vertical Separation	**None**	**1**

RHFA **0.00**

Notes

- **Site visit 10/9/2013 w/A.Marquez** **CHSTS Preliminary Alignment "H"**
- **CHSTS Alignment "H" bypasses Hanford to the east, well beyond 125 feet from BNSF**

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP0203-13, SR-43 North of Corcoran
CHSR Stationing: 2525 to 2635, 11000 feet

Field Visit: John Cockle
Date: 10/16/2013
Assessment by:
Date:
Signature:

Railroad: BNSF

RR Mileposts	956.0	953.8
RR Derailment Rate	2.03	

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Through movement, no stops	0
Special trackwork	None	0
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open - Unfenced farmland on west side, SR-43 on east side w/out fence/barrier	0
Highway-grade crossing	Private crossing to be closed, Nevada Ave to be OH grade separation	0
Train defect detectors	Nearest TWD at MP 962.0	0
	Total Plus Base Condition of (1)	0.9
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Approx. 75 ft. between track centers	0.3
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.5
Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	Approx. 75 feet minimum separation for track centers and 10 feet minimum vertical separation.	0

RHFA: 0.00

Notes

- Site visit 10/16/2013 CHSTS Preliminary Alignment "C2"
- Grade crossings: Private Xing MP 955.74, Nevada Ave MP 954.00
- CHSTS to be placed on raised embankment/retained fill in narow strip of land between BNSF and SR-43.

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP0203-13
CHSR Stationing: 2525 to 2635

Assessment By: John Cockle
Date: 10/16/2013
Reviewed By:
Date:
Accepted by:
Date:

Railroad: BNSF

RR Mileposts	956.0	953.8
RR Derailment Rate	2.93 0.000000966	

Number of ~~annual~~ daily trains	38 ~~8760~~	SSDF	0.0085

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	0
Vertical Alignment	**Level** ✓	0
Type of Movement	**Through movement, no stops** ✓	0
Special trackwork	**None** ✓	0
Movement Authorization	**CTC - Dispatched from San Bernadino ROC** ✓	-0.1
Access to right-of-way	**Open** ✓	0
Highway-grade crossing	**None** Nevada Ave MP To be Closed? Private Xing MP 955.74	0
Train defect detectors	**None** ✓ MP 962.0 MP 943.7	0
	Total Plus Base Condition of (1)	0.9 (0.9)
Effect Factors		
Horizontal Alignment	**Tangent** ✓	0
Speed	**70 MPH for freight trains** ✓	0.2
Horizontal Distance	**Greater than 102 ft.** Approx 75ft. tracks centers?	0.3 ~~0~~
Elevation relative to CHSR	**At-grade**	0
Adjacent structure	**None** ✓	0
Overhead Structure	**None** ✓	0
	Total Plus Base Condition of (1)	~~1.2~~ (1.5)

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	~~1~~ (0)

RHFA: ~~01.39~~ (0)

Notes

- Nevada Ave MP 954.0 to be OH Grade Sep.
- Canal crossing MP 954.0, immediately (S) of Nevada
- HST curves in from (E) north of sta. 2525, curves away to (E) south of sta. 2635 to bypass Cucamonga
- HST alignment approx. 10 ft. above 100-yr flood plain, approx 12 ft. above OG
- SR 43 on (E) of HST alignment, BNSF on (W) of HST alignment

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP0203-14 Corcoran Bypass
CHSR Stationing: 2635 to 2990, 25500 feet

Railroad: BNSF

RR Mileposts	953.8	947.0
RR Derailment Rate	2.03	

Field Visit: John Cockle
Date: 10/16/2013
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Passing track, Amtrak stop, and multiple active industrial spurs.	0.3
Special trackwork	Multiple main track turnouts.	0.2
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open	0
Highway-grade crossing	Multiple grade crossings: Orange Ave., Brokaw Ave., Whitley Ave., and Sherman Ave.	0.3
Train defect detectors	None	0
	Total Plus Base Condition of (1)	1.7
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2
Horizontal Distance	CHSTS alignment K4 to bypass Corcoran east of town, well beyond 125 ft. from BNSF track.	0
Horizontal/Vertical Separation	None	1

RHFA: 0.00

Notes

- Site visit 10/16/2013 w/A.Marquez — CHSTS Preliminary Alignment "C2"
- CHSRP to bypass Corcoran downtown/Industrial area to the east.

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP0203.14 Cucamonga Bypass
CHSR Stationing: 2635 to 2990

Assessment By: John Cockle
Date: 10/16/13
Reviewed By:
Date:
Accepted by:
Date:

Railroad	BNSF 953.8	947.X
RR Mileposts		
RR Derailment Rate	0.000000966	

Number of ~~annual~~ Daily trains	38 ~~8760~~	SSDF	0.0085

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	~~Through movement, no stops~~ Passing tracks, Industries, Amtrak station	0.3 ~~0~~
Special trackwork	~~None~~ Multiple MT turnouts	0.2 ~~0~~
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open**	**0**
Highway-grade crossing	~~None~~ Multiple: Orange Ave, Bechan Ave, Whitley Ave, Sherman Ave	0.3 ~~0~~
Train defect detectors	**None**	**0**
	Total Plus Base Condition of (1)	~~0.9~~ 1.7
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to CHSR	**At-grade**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1.2** 1.2
Horizontal Distance	**Less than 125 ft.**	~~1~~ 0
Horizontal/Vertical Separation	**None**	**1**

RHFA: 0 ~~91.39~~

Notes

- (S) of Nevada Ave & (N) of Baylor
- CHSRP bypassing downtown to the east

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location **CP0203-15 Tule River Crossing**
CHSR Stationing **2990 to 3060, 7000 feet**

Railroad **BNSF**

RR Mileposts	947.0	945.8
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/16/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Through movement, no stops	0
Special trackwork	Timber pile trestle over Tule River, MP 946.3	0.1
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open, SR-43 on east side of BNSF	0
Highway-grade crossing	Avenue 144 to remain for BNSF crossing, Avenue 136 to be closed.	0.3
Train defect detectors	MP 943.7	-0.1
	Total Plus Base Condition of (1)	1.2
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	OH crossing of BNSF and SR-43, assume structures to be outside 25 ft. BNSF operating envelope.	0

RHFA **0.00**

Notes

- Site visit 10/16/2013 CHSTS Preliminary Alignment "C2"
- Avenue 136 is to be closed. Located at old station site of Blanco, MP 945.9
- CHSRP to bypass Corcoran downtown/industrial area to the east, cross over BNSF alignment on large, skewed elevated structure with support columns outside of 25 foot setback from BNSF main track

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP0283-15 Tule River
CHSR Stationing: 2998 to 3060, 7000 ft.

Railroad: BNSF 947.0 945.8
RR Mileposts:
RR Derailment Rate: 2.03 0.000000966

Assessment By: John Cockle
Date: 10/16/13
Reviewed By:
Date:
Accepted by:
Date:

Number of ~~annual~~ daily trains	38	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	Ø 0
Vertical Alignment	**Level**	Ø 0
Type of Movement	**Through movement, no stops**	Ø 0
Special trackwork	~~None~~ Tule River Trestle	.1 0
Movement Authorization	~~Other than centralized track~~ CTC	-.1 0
Access to right-of-way	**Open**	Ø 0
Highway-grade crossing	~~None~~ Ave 144 to remain, Ave 136 to close	.3 0
Train defect detectors	None TWD MP 943.7	-.1 0
	Total Plus Base Condition of (1)	1 (1.2)
Effect Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Speed	~~Less than 20 MPH~~ 70 MPH	.2 0
Horizontal Distance	**Greater than 102 ft.** ✓	Ø 0
Elevation relative to CHSR	**At-grade** ✓	Ø 0
Adjacent structure	**None** ✓	Ø 0
Overhead Structure	**None** ✓	Ø 0
	Total Plus Base Condition of (1)	1 (1.2)
Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	~~None~~ OH crossing BNSF	1 (Ø) ☆

RHFA: Ø ~~0.01~~

Notes
- Grade crossings: Ave 144 Ave 136 MP 945.85
-
- SR43 on (E) S/E BNSF
- HST to Ch over SR43 and BNSF
- Cross Tule River MP 946.3 on timber pile trestle

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location **CP0203-16 Blanco South**
CHSR Stationing **3060 to 3210, 15000 feet**

Railroad **BNSF**

RR Mileposts	945.8	942.9
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/16/2013**
Assessment by:
Date:

Signature:

Number of daily trains (average)	**38**	SSDF	**28156.1000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**North approach to Angiola Siding. Through movement, no stops.**	**0**
Special trackwork	**None**	**0**
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open - SR-43 on east side.**	**0**
Highway-grade crossing	**Avenue 136 is to be closed, Avenue 128 and Avenue 120 to be OH grade separations.**	**0**
Train defect detectors	**TWD @ MP 943.7**	**-0.1**
	Total Plus Base Condition of (1)	**0.8**
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to OG	**3-4 above OG**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1.2**

Horizontal Distance	**Less than 125 ft.**	**1**
Horizontal/Vertical Separation	**None**	**1**

RHFA **270.30**

Notes

- **Site visit 10/16/2013** **CHSTS Preliminary Alignment "P"**
- **Old railroad station site at Blanco, MP 945.9 just to north where CHSRP touches down**
- **Avenue 128 and Avenue 120 grade crossings to be closed**

ARHRAM Worksheet

Location: CP 0203-16
CHSR Stationing: 3060 32.10

Railroad: BNSF 945.8 942.9
RR Mileposts:
RR Derailment Rate: 2.83 ~~0.000000966~~

Assessment By: John Cockle
Date: 10/16/13
Reviewed By:
Date:
Accepted by:
Date:

Number of ~~annual~~ daily trains	38	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Vertical Alignment	**Level** ✓	Ø 0
Type of Movement	**Through movement, no stops** ✓	Ø 0
Special trackwork	**None** ✓	Ø 0
Movement Authorization	~~Other than main track~~ CTC	-.1 0
Access to right-of-way	**Open** SR43 in (E) side	Ø 0
Highway-grade crossing	**None** Ave 128 to be OH Grade Sep Ave 120 " " " "	Ø 0
Train defect detectors	**None** TWD MP 943.7	-.1 0
	Total Plus Base Condition of (1)	1 (0.8)
Effect Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Speed	~~Less than 20 MPH~~ 70 MPH	.2 0
Horizontal Distance	**Greater than 102 ft.** ✓	Ø 0
Elevation relative to CHSR	**At-grade** ✓	Ø 0
Adjacent structure	**None** ✓	Ø 0
Overhead Structure	**None** ✓	Ø 0
	Total Plus Base Condition of (1)	1 (1.2)

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA: 270,300 ~~0.01~~

Notes
- Grade crossings: Ave 128 MP 944.69, Ave 120 MP 943.52

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP0203-17 WSS Angiola
CHSR Stationing: 3210 to 3220, 1000 feet

Railroad: BNSF

RR Mileposts	942.9	942.7
RR Derailment Rate	2.03	

Field Visit: John Cockle
Date: 10/3/2013
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Angiola passing siding	0.1
Special trackwork	Dual-control switch	0.1
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open	0
Highway-grade crossing	None	0
Train defect detectors	TWD @ MP 943.7	-0.1
	Total Plus Base Condition of (1)	1
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA: 337.87

Notes

- Site visit 10/03/2013 w/A. Marquez CHSTS Preliminary Alignment "P"

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP 203-17 WSW Angola
CHSR Stationing: 3210 to 3200
Railroad: BNSF 942.7 942.9
RR Mileposts:
RR Derailment Rate: 2.03 ~~0.000000968~~

Assessment By: John Cockle
Date: 10/3/13
Reviewed By:
Date:
Accepted by:
Date:

Number of ~~annual~~ daily trains	38	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Vertical Alignment	**Level** ✓	Ø 0
Type of Movement	~~**Through movement, no stops**~~ Passing siding	.1 0
Special trackwork	~~None~~ MT DCS	.1 0
Movement Authorization	~~Other than main track~~ CTC	.1 0
Access to right-of-way	**Open** ✓ SR43 on east	Ø 0
Highway-grade crossing	**None** ✓	Ø 0
Train defect detectors	**None** TWD @ MP 943.7	.1 0
	Total Plus Base Condition of (1)	1 (1.0)
Effect Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Speed	~~**Less than 20 MPH**~~ 70 MPH	.2 0
Horizontal Distance	**Greater than 102 ft.** ✓	Ø 0
Elevation relative to CHSR	**At-grade** ✓	Ø 0
Adjacent structure	**None** ✓	Ø 0
Overhead Structure	**None** ✓	Ø 0
	Total Plus Base Condition of (1)	1 (1.2)

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA: 332.87 **0.01**

Notes
- WSW Angola MP 942.8

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location CP0203-18 Angiola Siding
CHSR Stationing 3220 to 3300, 8000 feet

Railroad BNSF

RR Mileposts	942.7	941.1
RR Derailment Rate	2.03	

Field Visit John Cockle
Date: 10/3/2013
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Angiola passing siding and industries, although active industry to be relocated by CHSTS	0.1
Special trackwork	Multiple industry switches	0.2
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open to SR-43 on east side, open to the industries on the west side..	0
Highway-grade crossing	Avenue 112 to be OH grade Separation	0
Train defect detectors	TWD @ MP 943.7	-0.1
	Total Plus Base Condition of (1)	1.1
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA 371.66

Notes

- Site visit 10/03/2013 w/A. Marquez CHSTS Preliminary Alignment "K4"
- Industry on west side (PFFJ, LLC) appears to be a feed mill receiving carloads of grain and is active.
- Industry on the west side is derelict and appears to be out of service.

RFP No.: 13-57 – Addendum No. 5 - 10/09/2014

ARHRAM Worksheet

Location: CP 283-18 Angiola Siding
CHSR Stationing: 3220 to 3300, 8000 ft.

Railroad: BNSF 942.7 941.1
RR Mileposts:
RR Derailment Rate: 2.03 ~~0.000000966~~

Assessment By: John Cockle
Date: 10/3/13
Reviewed By:
Date:
Accepted by:
Date:

Number of ~~annual~~ daily trains	38	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Vertical Alignment	**Level** ✓	Ø 0
Type of Movement	Industry tracks on both (E) and (W) **Through movement, no stops**	.1 0
Special trackwork	~~None~~ 2 mt Turnouts, Industries on both sides	.2 0
Movement Authorization	~~Other than main track~~ CTC	-.1 0
Access to right-of-way	**Open** ✓ SR-43 on east	Ø 0
Highway-grade crossing	**None** Ave 112 to become OH	Ø 0
Train defect detectors	**None** TWD @ MP 943.7	-.1 0
	Total Plus Base Condition of (1)	1
Effect Factors		
Horizontal Alignment	**Tangent** ✓	Ø 0
Speed	~~Less than 30 MPH~~ 70 mph	.2 0
Horizontal Distance	**Greater than 102 ft.** ✓	Ø 0
Elevation relative to CHSR	**At-grade** ✓	Ø 0
Adjacent structure	**None** ✓	Ø 0
Overhead Structure	**None** ✓	Ø 0
	Total Plus Base Condition of (1)	1

1.1

1.2

Horizontal Distance	**Less than 125 ft.**	1
Horizontal/Vertical Separation	**None**	1

RHFA: 371.66 ~~0.01~~

Notes

- Site visit 10/3/13 w/ Ana Marquez
- Industry on (E) side abandoned
- Industry on (W) side active, but to be relocated by CHSTS
- Grade crossing = Ave 112 MP 942.36

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ARHRAM Worksheet

Location **CP0203-19 ESS Angiola**
CHSR Stationing **3300 to 3310, 1000 feet**

Railroad **BNSF**

RR Mileposts	941.1	940.9
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/3/2013**
Assessment by:
Date:

Signature:

Number of daily trains (average)	**38**	SSDF	**28156.1000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**East Switch Angiola passing siding**	**0.1**
Special trackwork	**Dual-control switch**	**0.1**
Movement Authorization	**CTC - Dispatched from San Bernadino ROC**	**-0.1**
Access to right-of-way	**Open to SR-43 on east side.**	**0**
Highway-grade crossing	**None**	**0**
Train defect detectors	**TWD @ MP 943.7**	**-0.1**
	Total Plus Base Condition of (1)	**1**
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**70 MPH for freight trains**	**0.2**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to OG	**3-4 above OG**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1.2**

Horizontal Distance	**Less than 125 ft.**	**1**
Horizontal/Vertical Separation	**None**	**1**

RHFA **337.87**

Notes

- Site visit 10/3/2013 w/A. Marquez	**CHSTS Preliminary Alignment "P"**
- East Switch Angiola MP 941.0	

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ARHRAM Worksheet

Location	CP Ø203-19 ESW Angiola	Assessment By:	John Cockle
CHSR Stationing	3300 to 3310, 1000 ft	Date:	10/3/13 w/A. Marquez
Railroad	BNSF 940.9 941.1	Reviewed By:	
		Date:	
RR Mileposts		Accepted by:	
RR Derailment Rate	2.83 ~~0.000000066~~	Date:	

Number of ~~annual~~ daily trains	38 ~~1~~	SSDF	0.0000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent ✓	Ø 0
Vertical Alignment	Level ✓	Ø 0
Type of Movement	~~Through movement/no stops~~ South end passing siding	.1 0
Special trackwork	~~None~~ MT Switch	.1 0
Movement Authorization	~~Other than main track~~ CTC	-.1 0
Access to right-of-way	Open ✓	Ø 0
Highway-grade crossing	None ✓ SR-43 on (E) side	Ø 0
Train defect detectors	~~None~~ TWD @ MP 943.7	-.1 0
	Total Plus Base Condition of (1)	1 (1.Ø)
Effect Factors		
Horizontal Alignment	Tangent ✓	Ø 0
Speed	~~Less than 30 MPH~~ 70 mph	.2 0
Horizontal Distance	Greater than 102 ft. ✓	Ø 0
Elevation relative to CHSR	At-grade ✓	Ø 0
Adjacent structure	None ✓	Ø 0
Overhead Structure	None ✓	Ø 0
	Total Plus Base Condition of (1)	1 (1.2)

Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA 337.82 ~~0.01~~

Notes

- ESW Angiola Dual control switch MP 941.Ø

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ARHRAM Worksheet

Location **CP0203-20 Deer Creek**
CHSR Stationing **3310 to 4010, 24000 feet (see note below)**

Railroad **BNSF**

RR Mileposts	940.9	936.5
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/3/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	South approach to Angiola siding, primarily through movements/no stopping	0
Special trackwork	None	0
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open to SR-43 on east side.	0
Highway-grade crossing	None	0
Train defect detectors	TWD @ MP 943.7	-0.1
	Total Plus Base Condition of (1)	0.8
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2
Horizontal Distance	Less than 125 ft.	1
Horizontal/Vertical Separation	None	1

RHFA **270.30**

Notes

- Site visit 10/3/2013 w/A. Marquez CHSRP Preliminary Alignments "P and A1"
- Deer Creek Bridge MP 936.5, steel girder bridge
- CHSRP curves away to the west at Deer Creek to bypass Allensworth
- CHSRP stationing on preliminary drawings has equationing factor of (-46,000 feet)

ARHRAM Worksheet

Location: CP 2083 - 20 Deer Creek
CHSR Stationing: 3310 to 4010 24000 ft.

Railroad: BNSF 936.5 940.9
RR Mileposts:
RR Derailment Rate: 2.83 ~~0.000000956~~

Assessment By: John Cockle
Date: 10/3/13
Reviewed By:
Date:
Accepted by:
Date:

Number of ~~annual~~ trains	38 1	SSDF	0.0000

Category	Site-Specific Characteristics		Rating
Causal Factors			
Horizontal Alignment	**Tangent** ✓		Ø 0
Vertical Alignment	**Level** ✓		Ø 0
Type of Movement	**Through movement, no stops** ✓		Ø 0
Special trackwork	**None** ✓		Ø 0
Movement Authorization	~~Other than main track~~ CTC		-.1 0
Access to right-of-way	**Open** ✓		Ø 0
Highway-grade crossing	**None** Ave 88 King to become OH		Ø 0
Train defect detectors	**None** TWD @ MP 943.7		-.10
		Total Plus Base Condition of (1)	1 (.8)
Effect Factors			
Horizontal Alignment	**Tangent**		Ø 0
Speed	**Less than 20 MPH** 70 mph		.2 0
Horizontal Distance	**Greater than 102 ft.**		Ø 0
Elevation relative to CHSR	**At-grade**		Ø 0
Adjacent structure	**None**		Ø 0
Overhead Structure	**None**		Ø 0
		Total Plus Base Condition of (1)	1 (1.2)
Horizontal Distance	**Less than 125 ft.**		1
Horizontal/Vertical Separation	**None**		1

RHFA: 270.30 **0.01**

Notes
- Deer Creek Bridge MP 936.5
- HSR is far west of BNSF ⓒ of Deer Creek
- Alignments "P" and "A1". Equation: = 46000ft

9000 3460 3310 15000 24000 46000

ARHRAM Worksheet

Location **CP0203-21 Allensworth Bypass**
CHSR Stationing **4010 to 5270, 126000 feet (approx. 24 miles)**

Railroad **BNSF**

RR Mileposts	936.5	917.0
RR Derailment Rate	2.03	

Field Visit **John Cockle**
Date: **10/3/2013**
Assessment by:
Date:
Signature:

Number of daily trains (average)	38	SSDF	28156.1000

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	Tangent	0
Vertical Alignment	Level	0
Type of Movement	Through movement, no stops	0
Special trackwork	None	0
Movement Authorization	CTC - Dispatched from San Bernadino ROC	-0.1
Access to right-of-way	Open	0
Highway-grade crossing	None	0
Train defect detectors	None	0
	Total Plus Base Condition of (1)	0.9
Effect Factors		
Horizontal Alignment	Tangent	0
Speed	70 MPH for freight trains	0.2
Horizontal Distance	Greater than 102 ft.	0
Elevation relative to OG	3-4 above OG	0
Adjacent structure	None	0
Overhead Structure	None	0
	Total Plus Base Condition of (1)	1.2

Horizontal Distance	CHSTS bypasses Allensworth State Park to the west, far beyond 125 ft. from BNSF	0
Horizontal/Vertical Separation	None	1

RHFA **0.00**

Notes

- Site visit 10/16/2013
- CHSRP curves away to the west at Deer Creek to bypass Allensworth
- CHSRP Preliminary Alignment "A1" takes the alignment far to the west to go around Allensworth SP.

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ARHRAM Worksheet

Location: CP03 Allensworth Bypass
CHSR Stationing: 4818 to 5278, 126,000 (24 miles)

Assessment By: John Cockle
Date: 10/3/13
Reviewed By:
Date:
Accepted by:
Date:

Railroad	BNSF 917.0	936.5
RR Mileposts		
RR Derailment Rate	0.000000966	

Number of annual trains	**1**	SSDF	**0.0000**

Category	Site-Specific Characteristics	Rating
Causal Factors		
Horizontal Alignment	**Tangent**	**0**
Vertical Alignment	**Level**	**0**
Type of Movement	**Through movement, no stops**	**0**
Special trackwork	**None**	**0**
Movement Authorization	**Other than main track**	**0**
Access to right-of-way	**Open**	**0**
Highway-grade crossing	**None**	**0**
Train defect detectors	**None**	**0**
	Total Plus Base Condition of (1)	**1**
Effect Factors		
Horizontal Alignment	**Tangent**	**0**
Speed	**Less than 20 MPH**	**0**
Horizontal Distance	**Greater than 102 ft.**	**0**
Elevation relative to CHSR	**At-grade**	**0**
Adjacent structure	**None**	**0**
Overhead Structure	**None**	**0**
	Total Plus Base Condition of (1)	**1**

Horizontal Distance	Less than 125 ft. – CHSR to west of BNSF	0
Horizontal/Vertical Separation	**None**	**1**

RHFA: ~~0.01~~ 0

Notes

– CHSR is mile or more to west of BNSF to bypass Allensworth SHP.

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